LA36

LA36 TERMINATOR (DL11&KL11)

CZLACE0

AH-8899E-MC

FICHE 1 OF 1

DEC 1978

digital

MADE IN USA

IDENTIFICATION

Product Code: AC-8898E-MC

Product Name: CZLACE0 LA36 TERM (DL11 & KL11)

Date Created: August 1978

Maintainer: DIAGNOSTIC GROUP

Authors: Robert W. Baker

R. Quenneville
Ralph A. Schauber

John V. Chatalian

HISTORY

1.0 DECO CZL
AC-E-0

1.1.0 Closed Problem Report AA3318

1.1.1 It was reported that a
DL11-A operated at 110 baud caused fai-
lure in the AREAD routine be
cause the 200 msec. delay is not
of sufficient duration to allow settin
g of the Receiver Regis-
ter Status 'DONE'' bit through the Maintena
nce bit facility.
The time delay was increased from 200 to 600 msec.

1.2.0 Closed Problem Report AA3643

1.2.1 Tests 56,57,60,61,62,63,64,65,an
d 66 do not run properly when
run on an LSI-11. This problem was r
esolved by changing the
branch after the CHAIN command to go back to
test for the
LSI-11 switch in order to effect the appropriate action
during
each test.

1.2.2 Second time-out in Test 64 allows excessive
wait for operator
response. The time delay was reduced from ''177777''
to ''600''.

1.2.3 Common routine TYPE does not save the contents of R0 resul
ting
in the loss of this information and consequent failure.

Instructions were included to save the contents of R0 on entry
int
o the routine and to restore them upon exit.

1.2.4 Loss of stack contents fo
r non-LSI-11 computers due to incor-
rect sequence of instructions i
n Test 65 was also reported in
Problem Report AA3803. Refer to 1.3.1.

1.3.0 Closed Problem Report AA3803

1.3.1 Testing of non-LSI-11 computer
s results in the program hanging
up because the stack gets popped awa
y in Test 65. The branch
after the test for the LSI-11 switch in Test 6
5 should go to
the CHAIN command for proper exit from the test for n
on-LSI-11
machines. This change supersedes the change released in DEP
O
MD-11-DZLAC-D-1.

TABLE OF CONTENTS

6.2
Echo Tests
6.2.1 Test20 - Character Echo Test
6.2.2 Test21
- Line Echo Test, Fast Rate
6.2.3 Test22 - Line Echo Test, Slow Rate
6.
2.4 Test23 - Character/Code Echo Test
6.2.5 Test24 - Selected Pat
tern Echo Test
6.2.6 Test25 - Bell Echo Test
6.4 Standard I/O Tes
ts

1.0 ABSTRACT

This diagnostic is divided into three basic sections:

1. A check of the console terminal interface logic.

2. A check of the printing characteristics and control logic.

3. An echo portion designed to check the keyboard and to aid in the diagnosis of terminal problems.

Patterns used by the printing tests were chosen for ease of visual verification. The echo tests were designed for maximum flexibility, with Test 24 allowing any desired pattern to be used.

2.0 REQUIREMENTS

2.1
EQUIPMENT AND ASSIGNMENTS

The diagnostic is written to run on all models of the PDP-11 computer with either a KL11 or DL11 console terminal interface. The diagnostic is preset to test up to 16 additional terminals (on DL11's) assigned between addresses 776500 and 776676. This preset quantity (16) and preset address (776500) can be changed by depositing the quantity in DLNR and the starting address in DLADR. For example, to allow for up to 31 additional terminals, the address 775610 could be placed into DLADR and the octal equivalent of 31, i.e., (37) would be placed into DLNR. The number of additional DL11's actually tested will be adjusted automatically downward based upon the first DL11 address (within the implied range) found to be unresponsive. Thus if there is no DL11 present to match the address in DLADR only the console terminal will be tested. Therefore, all DL11's in excess of the console terminal must have contiguous address assignments with the lowest address cor-
res

ponding to the value in DLADR.

The console terminal (assigned standard) can b
e reassigned by placing
the address of its receiver status register into CO
NADD and its re-
ceiver interrupt vector into CONVEC. This reassignment can be
made to
a terminal within the set of terminals implied by DLNR and DLADR with-

out adverse effect. Note that a terminal with a slower speed (if any)
will
determine the speed at which all of the terminals are tested.
Such a termina
l should generally be excluded from the test, or tested
separately. (Refer
to the symbol definitions in the listing for the
above mentioned locations.)

2.2 STORAGE

The diagnostic program uses all of 4K of memory with exception
of the
area used by the absolute loader.

2.3 PRELIMINARY PROGRAMS

Any ap
plicable PDP-11 diagnostics should be run on the processor. If
any errors a
re encountered during the interface check, refer to the
appropriate interface
diagnostic for further help in locating the
problem if needed.

2.4 ADDITIONAL PROGRAMS

This diagnostic is for verification of basic terminal fu
nctions only.
If the terminals under test have hardware options installed run
diag-
nostic MAINDEC-11-DZLAF-A , the LA36 TERMINAL OPTIONS TEST.

3.0 LOADING PROCEDURE AND INITIALIZATION

Load the LA36 diagnostic program tape
following normal procedures.
Before starting the program, refer to the desc
ription of the routine
'DLY'. Time delays used by the program are a function
of the CPU
model and memory type and should be set-up before running the di
agnos-
tic. The routine is preset for a PDP-11/05 with core memory. Refer
to Section 2.1 for non-standard terminal addresses and for testing
multiple
DL11 interfaces.

If a hardware switch register does not exist, the program w
ill use the
contents of location 176 as the value of the switches. Therefore,
be
sure to load location 176 with the switch value before starting the
pro
gram when not using hardware switches.

If the CPU is an LSI-11, 11/03 be sure
to set switch register bit 9 to
a 1. Special tests are run on the DLV11 inter
face.

4.0 STARTING PROCEDURE

SEQ 0009

4.1 STARTING ADDRESSES

200(8) = Run with Switch Register Control
- perform Console T
erminal I/O tests.
204(8) = Run with Switch Register Control

- skip Console Terminal I/O tests.
210(8) = Run with Keyboar
d Control
- perform Console Terminal I/O tests.
214
(8) = Run with Keyboard Control
- skip Console Terminal I/O t
ests.

4.2 Switch Register Control With I/O Tests

A. Set the switch register to 200(8) and press the load address switch.

B. Set switch register bit 9 to a 1 if the processor is an LSI-11, 11/0
3. Refer to Section 5.1.5.

C. Set the switch register bits 7-0 equal to the paper width in terms of the number of columns (octal). Refer to Section 5.1.8.

D. Set the switch register bit 8 equal to 1 or 0 and press the start switch. A message will be printed indicating the number of DL11's being tested. Refer to Section 5.1.6.

E. If bit 8 were zero when starting, the Printer tests are executed sequentially, after the entire series of I/O tests are executed.

F. If bit 8 was set when the start switch was pressed, the entire series of I/O tests will be executed and the CPU will halt at location SELHLT. The program will then be waiting for control via the switch register.

4.3 Switch Register Control - Without I/O Tests

Same as Section 4.2 except in step A, set the switch register to 204(8).

4.4 Keyboard Control - With I/O Tests

A. Set the switch register to 210(8) and press the load address switch.

B. Set the switch register bits 7-0 equal to the paper width in terms of the number of columns (octal). Refer to Section 5.1.8.

C. Set switch register bit 9 to a 1 if the processor is an LSI-11, 11/03. Refer to Section 5.1.5.

D. Set switch 8 and press the start switch. A message will be printed indicating the number of DL11's being tested. Refer to Section 5.1.6.

E. If bit 8 was zero when starting, the printer tests are executed sequentially after the entire series of I/O tests are executed.

F. If bit 8 were set when the start switch was pressed, the entire series of I/O tests will be executed followed by the select test message. The program will then be waiting for a test selection via any terminal keyboard. Refer to Section 5.2.

4.5 Keyboard Control - Without I/O Tests

Same as Section 4.4 except in step A, set the switch register to

214 (8).

5.0 OPERATING PROCEDURE

The program can be controlled in either of two methods: by the con-

sole switch register or from the keybo
ard of the terminal(s) under
test.

SEQ 0012

5.1 SWITCH REGISTER CONTROL

The variou
s switches and their functions are listed below. Switches
may be changed
and set as desired except as noted in the specific
switch descriptions. Refe
r to the detailed switch descriptions for
further, more complete information
.

SWITCH NUMBER DESCRIPTION

15 1(up) = HAL
T AT END OF TEST
0(down) = CONTINUE TEST SEQUENCE

14 1(up) = CONTINUE ON ERROR
0(down) = HALT ON
ERROR

13 1(up) = DRIVE ONLY CONSOLE TERMINAL

0(down) = DRIVE ALL TERMINALS

11 1(up) = LOOP ON
INDIVIDUAL TEST
0(down) = NORMAL TEST SEQUENCE

9
1(up) = CPU TYPE IS AN LSI-11, 11/03
0(down) =
ALL OTHER PDP-11'S

8 1(up) = RUN TEST ONCE AND HALT

0(down) = LOOP ON TEST SEQUENCE

5-0
TEST NUMBER SELECTION

7-0 NUMBER OF COLUMNS AT ST
ART-UP

5.1.1 Switch 15

With switch 15 in the up position, the program
will halt at the end of
the current test. Replacing switch 15 to the down pos
ition and press-

ing CONTINUE will continue the normal test operation. Dur
ing the
halt, any of the control switches may be changed or set as desired.

SEQ 0014

5.1.2 Switch 14

Placing switch 14 in the up position will cause the pro
gram to contin-
ue on errors during any of the I/O tests only. With switch 1
4 down,
the program will halt (at ERRHLT) on any errors during the I-O tests

with the location of the error in R0. Pressing CONTINUE will cause
the pro
gram to continue if switch 14 is down. With switch 14 up,
pressing contin
ue will cause the program to loop on the error.

NOTE

Error halts can occur only during the I/O tests. The terminal is connected to a serial line and there is no error in- formation returned to the program from t he terminal. Therefore the program cannot report errors occurring in the terminal. Errors detected during the interface tests will result in halts as described abo ve.

5.1.3 Switch 13

Placing switch 13 in the down position will cause the driving of all multiple terminals during the Printer tests only. If swi tch 13 is up, only the console terminal is driven.

** Note: Switch 13 shoul d only be changed when the program is waiting for a test selection.

5.1. 4 Switch 11

Placing switch 11 up at any time will cause the program to loop on the current test as long as switch 11 remains up. Replacing switch 11 down will cause the program to resume normal operation at the comple- tion of the test.

5.1.5 Switch 9

Placing switch 9 up at the start of the test will cause an automatic change in the DELAY timing, and the execution of special DLV11 I/O tests. The DLV11 has no maintenance mode and will cause th

e program
to hang if tested as a DL11.

5.1.6 Switch 8

With switch 8
 in the down position the program will continue to loop
through the present t
est sequence. Placing switch 8 up will cause the
program to halt (at SELHLT) a
t the completion of the current test.
After the halt, set the control switc
hes as desired and set switches 5
to 0 to the next desired test number, and the
n press CONTINUE to start
the test.

When starting the diagnostic the operator
 can select a specific test
rather than automatically starting the printing
test sequence by set-
ting switch 8 up before starting the diagnostic. Upon c
ompletion of
the I/O test sequence (if being run) the program will either ha
lt at
SELHLT waiting for a test selection via the switch register or print
t
he select test message and wait for a test selection from any key-
board. R
efer to Section 4 for further information.

5.1.7 Switches 5 to 0

Swit
ches 5 to 0 are used to select specific tests when under switch
register con
trol. Test numbers are always in octal.

5.1.8 Switches 7 to 0 (at start
-up only)

At start-up only, switches 7 to 0 are used to set the desired maxi
mum
number of columns the diagnostic is to test. If the number set is
gre
ater than 132(10) or less than 30(10), the program will default to
132(10). T
he value set must be in octal form. Thus, for normal oper-
ation leave switche
s 7 to 0 down to test the full 132(10) columns.

5.2 KEYBOARD CONTROL

The p
rogram will be under keyboard control whenever the diagnostic is
started at lo
cation 210 or 214. Switches on the console switch regis-
ter will have no effe
ct when under terminal control except for switch
15. The I/O tests cannot be
selected when under keyboard control.

To stop a test at any time, type the 'R
UBOUT'' or 'DELETE'' key on any
keyboard. Any terminal may stop the test and
select the next test if
switch 13 is down. When a test is stopped by typing
a 'RUBOUT'' or
'DELETE', the test will terminate and the following message
will be
typed:

SELECT TEST NUMBER

At this time, type the desire
d test number followed by any one of the
following control characters:

. (period) = Run the selected test once and return for another
test selection.

L = Loop on the selected test unt
il a 'RUBOUT'' is
typed.

S = Start the
test sequence with the selected test.
Continue to loo
p on the printing test sequence
until a 'RUBOUT'' is typed
.

The 'L'' or 'S'' may be either upper or lower case, but the test number
m
ust always be a 2 digit octal number. The test number and terminator
are echoe
d by the program, thus each character will be printed twice
if the terminal
is in half duplex. For all echo tests, the 'L'' and
'S'' will only run the tes
t once (the same as if typing a period). For

all option tests, the "S" will o
nly run the test once (the same as if
typing a period), however, typing an "L"
will cause the program to
loop on the selected test. If an error is detect
ed in the test selec-
tion (illegal test number or control character), a quest
ion mark is
printed and the message will be repeated.

6.0 TEST DESCRIPTIONS

6.1 PRINTING TESTS

These tests are designed as a test of the printing mechanism and the associated control logic. At the beginning of each test, the test number will be printed indicating which test is being executed and, if the test is a function of the number of columns, the number of columns being tested will be indicated. A detailed description and sample patterns for each printing test follows:

6.1.1 Test 0 - Data Path Test

This test is used to test the data lines to and through the interface and to the terminal. An alternating bit pattern is sent which will print alternating *'s and U's in a checkerboard pattern to the maximum column width. The starting character for each line is alternated and a total of four lines are printed.

With the Auto Line Feed Option set to produce an automatic line feed after every received carriage return, there will be a blank line between each printed line.

EXAMPLE:

```
          *U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U

U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*
          *U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U

    U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*
```

6.1.2 Test 1 - Printable Character Test

This test produces a check of all 94(10) printable characters. The

ch
aracters are printed in groups of three with three groups per line, SEQ 0021
separated
by three spaces between groups. The first column will con-
tain all ASCII
codes from 040 to 077. Column two will contain all
ASCII codes from 100 to 13
7 - primarily the capital letter set. The
last column will contain all ASC
II codes from 140 to 176 - primarily
the small letter set.

With the Auto Lin
e Feed Option set to produce an automatic line feed
after every received c
arriage return, there will be a blank line
between each printed line.

```
EXAM
PLE:
                    @@@     '''
              !!!   AAA     aaa
              ;;;   BB
B    bbb
              ###   CCC     ccc
              $$$   DDD     ddd
              %%%   E
EE    eee
              &&&   FFF     fff
              '''   GGG     ggg
              (((
HHH    hhh
              )))   III     iii
              ***   JJJ     jjj
              +++
 KKK    kkk
              ,,,   LLL     lll
              ---   MMM     mmm
              ...
  NNN    nnn
              ///   OOO     ooo
              000   PPP     ppp
              111
   QQQ    qqq
              222   RRR     rrr
              333   SSS     sss
              44
4    TTT    ttt
              555   UUU     uuu
              666   VVV     vvv
              7
77    WWW    www
              888   XXX     xxx
              999   YYY     yyy

:::    ZZZ    zzz
              ;;;   [[[
              <<<   \\\
              ===   ]]
]
              >>>
              ???
```

6.1.3 Test 2 - Non-printable Character T
est

This test checks all non-printable characters that have no control
f
unction in the LA36 terminal or the LA36 options (such as CR, LF, BS,

& BEL).
First the ASCII code will be printed followed by the mnemonic after a few separating spaces. Following the mnemonic, the actual control character will be sent three times and nothing should happen at the printer. This pattern is repeated, three times on a line, until all of the non-printing characters have been tested.

SEQ 0023

With the Auto Line Feed Option set to produce an automatic line feed after every received carriage return, there will be a blank line between each printed line.

EXAMPLE:

```
          001   SOH  002  STX
 006  ACK
          020   DLE  021  DC1  022  DC2
          023   DC3  024  DC
4  025  NAK
          026   SYN  027  ETB  030  CAN
          031   EM   032
SUB  034  FS
          035   GS   036  RS   037  US
          177   DEL
```

6.1.4 Test 3 - Carriage Return Test

This test checks the carriage return fr
om all even numbered columns
and the spacing of the solenoid head from the l
eft margin. It is also
a good check for proper operation of the position decod
er.

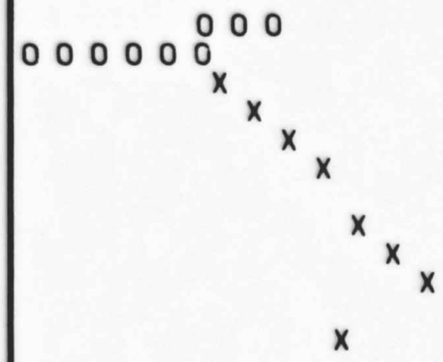
The test prints a full line of alternating 0's and spaces, starting
w
ith a 0. At the end of the line the print head is returned to the
left marg
in with a carriage return. The spaces are then filled in by
spacing the pri
nt head out from the left margin to the first space,
printing an 'X', and exec
uting a carriage return. This pattern is re-
peated until the line is complet
ed. Check to see that all X's are in
the middle of the space between the two z
eroes on either side of it.

EXAMPLE:

```
          0X0X0X0X0X0X0X0X0X0X0X0X0
X0X0X
```

With the Auto Line Feed Option set to produce an automatic line fe
ed
after every received carriage return, this test will print a line of
0's
and spaces, then print a diagonal line of X's. To correctly check
the encoder,
the Auto Line Feed Option should be disabled.

EXAMPLE:



6.1.5 Test 4 - Multiple Line Feed Test

This test checks the line feed capability of the printer by sending various groups of line feeds interspaced with reference lines. The number printed as the reference line indicates the number of line feeds that follow. The first and last lines also contain a string of dashes as reference points for measuring the total distance between the two dashed lines, i.e., 63(10) lines.

With the Auto Line Feed Option set to produce an automatic line feed after every carriage return, the number printed will indicate one less than the number of line feeds (the number of blank lines) that follow. The total distance between the two dashed lines will then be 69 lines.

EXAMPLE:

```
          01----------
------------------------------------
          02
          04


    08




          16
              \
               15 Blank Line
s
              /
          32
              \
               31 Blank Lines
              /
          00-----------------------------------------------
```

6.1.6 Test 5 - Single Line Feed Test

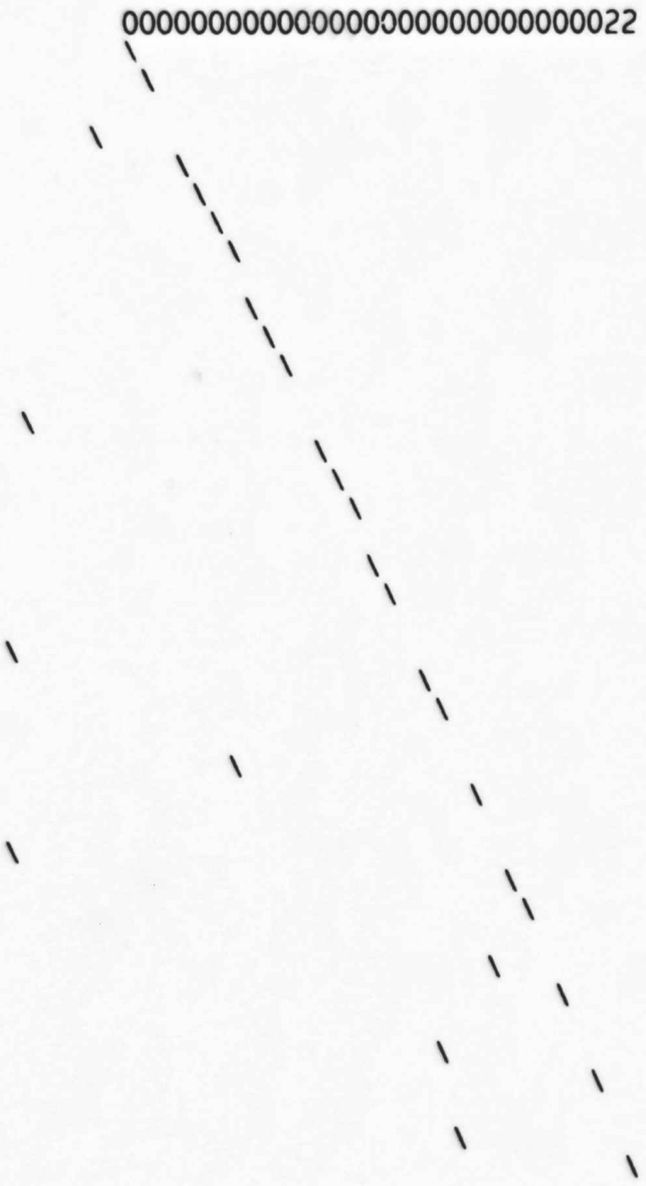
This test is designed to check the tim
ing of single line feeds and the
capability of doing line feeds in all colum
ns. Two reference lines
are used by this test (and Test 6) which also can be
used to easily
check the number of columns the printer is printing.

The fi
rst reference line contains 130(10) zeroes followed by two 2's
if testing 13
2(10) columns. If less than 132 columns, the line will
contain 0's for two l
ess than the maximum number of columns followed
by the two 2's. This referen
ce line is a quick check for 132(10) co-
lumns if testing the full 132(10) col
umns. The second reference line
prints a string of numbers (1 to 9 & 0) rep
eated to the maximum co-
lumn. This line, again, can be used as a quick check
of the number of
columns.

The line feed test is accomplished by: printing t
he first reference
line of 0's and two 2's; then either sending 60
(10) 3's, if
testing 132(10) columns, or waiting 1.8 seconds for an LCV, if tes
ting
less than 132(10) columns. If testing 132(10) columns, nothing
sh
ould happen, except for an LCV, at the end of the line. The 3's
should be
lost and never printed. After the LCV, with the print head
at the extreme rig
ht, a carriage return - line feed will be sent fol-
lowed by repeated backs
lashes "\" and linefeeds to print a diagonal
line down the paper. When a backs
lash is printed in the maximum co-
lumn, a carriage return will be sent imm
ediately after the line feed
and the second reference line of sequential number
s will be printed.
After completing the line, a carriage return - line feed
will be sent
and the program will wait one second for the carriage return func
tion
to complete. After the delay, the reference line will be repeated,
th
e last line being guaranteed to be correct. Any timing problems

during th
e line feeds will show as misprints or missing characters SEQ 0028
during the first
16(10) characters of the middle reference line.
Also, any paper feed pro
blems will cause misalignment of the slashes
forming the diagonal line.

EXAMP
LE:



With the Auto Line Feed Option set to produce an automatic line feed
after every received carriage return, there will be a blank line every

place a
carriage return is executed.

SEQ 0030

EXAMPLE:

```
          0000000022
          \
           \ \ \ \ \
                \ \ \
                   \ \ \
 \
          1234567890
          1234567890
```

6.1.7 Test 6 - Backspac
e Test

This test is designed to test the print timing as in Test 5 as well as the backward and forward movement of the print solenoid head.

The test cons
ists of the same first reference line as in Test 5 then a carriage return-line
feed. A full line is then printed using the fol-
lowing pattern:

```
Forward Slash   "/"
          Backspace
          Back Slash      "\"
```

This
pattern produces a line of all X's. The two slashes should cross exactly at
the middle, producing the X character. When the line is completed a carriage
return-line feed is sent and the last two refer-
ence lines are printed as in
Test 5. Any timing problems will show in
the first 16(10) characters of the mi
ddle reference line; again as in
Test 5.

SEQ 0032

With the Auto Line Feed Option set
 to produce an automatic line feed
after every received carriage return,
 there will be a blank line
between each printed line.

EXAMPLE:

```
00000000000000000000000000022
        XXXXXXXXXXXXXXXXXXXXXXXXXXXXX

     123456789012345678901234567890
         123456789012345678901234567890
```

6.1.8 Test 7 - Overprint Test

This test is designed to check the spacing and repeatable printing characteristics of the printer. Three rows of characters are each overprinted two times. The rows consist of the following characters alternated across the line:

Row 1 M-SP

Row 2 SP-@

Row 3 &-SP

The resulting pattern will be a checkerboard pattern and the overprinted characters should be aligned properly with the initial characters.

EXAMPLE:

```
          M
 M M M M M M M M M M M M M M
           @ @ @ @ @ @ @ @ @ @ @ @ @

& & & & & & & & & & & & & &
```

With the Auto Line Feed Option set to produce an automatic line feed after every received carriage return, the lines will not be overprinted. There will be three lines of each character with a blank line between each group of characters. The characters in each group should be in the same columns.

EXAMPLE:

```
          M M M M M M M M M M

     M M M M M M M M M M
          M M M M M M M M M M

           @ @ @ @ @
@ @ @ @
           @ @ @ @ @ @ @ @ @
           @ @ @ @ @ @ @ @ @
```

SEQ 0034

```
& & & & & & & & & &
        & & & & & & & & & &
        & & & & & & & & &
&
```

6.1.9 Test 10 - Printing Frequency Sweep Test

This test prints the char
acter 'H' repeatedly, 30(10) characters per
line for four lines. During t
he first two lines, the time interval
between characters is increased from 30(1
0) milliseconds to 1.8 sec-
onds using the following formula to create a loga
rithmic increase:

New Delay = Old Delay + Old Delay/16 + Old Delay/1
28

The last two lines do just the reverse. The time interval between
c
haracters is decreased from 1.8 seconds to 30(10) milliseconds
using the
following formula to again create a logarithmic decrease:

New Delay
= Old Delay - Old Delay/16 - Old Delay/128

Look for possible misalignment o
f the characters or spaces between
characters as an indication of timing pr
oblems.

With the Auto Line Feed Option set to produce an automatic line fee
d
after every received carriage return, there will be a blank line
betwe
en each printed line.

EXAMPLE:

```
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHH

         HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
H
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
```

6.1.10 Test 11 - Ribbon Feed T
est

This test checks the ribbon feed mechanism by printing a single column
o
f 24 lines of X's down the left hand margin of the page. Visually
check for
proper operation of the ribbon feed mechanism during this
test.

With the
 Auto Line Feed Option set to produce an automatic line feed SEQ 0036
after every re
ceived carriage return, there will be a blank line
between each printed lin
e.

EXAMPLE:

X
X
X
X
X
X
X

6.1.11 Test 12 - Printer Bell Test

T
his test checks the printer bell buffer to insure that eight bells
are dist
inctly heard, even when sent at the maximum transfer rate.
The program sends
8 bell codes at the maximum rate to the printer
then waits 2.5 seconds to
allow the operator to hear the bells.

6.1.12 Test 17 - Life Test

Th
is test runs continuously and is run as an individual, special test.
It is not
part of the standard printing test sequence.

This test prints 2 lines of each
printable character and then repeats
continuously. The second line of e
ach character is overprinted 4
times to conserve paper. At the end of each com
plete pass through the
character set, a message is printed indicating the nu
mber of passes
executed. If any character (except 'Rubout') is typed on the ke
yboard
during this test, the pattern will change and restart with the typed
character. This will only happen if keyboard control is in use.

EXAMPLE:

```
          AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
          AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AA
          BBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
          BBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
BBBBBB
```

If the Auto Line Feed Option is set to produce an automatic line fe
ed
after every received carriage return, the test will print six lines of
each
character with a blank line between the first and second lines as
well as betw
een each group of characters.

EXAMPLE:

```
          AAAAAAAAAAAAAAA
```

SEQ 0038

```
AAAAAAAAAAAAAAA
      AAAAAAAAAAAAAAAA
      AAAAAAAAAAAAAAAA

 AAAAAAAAAAAAAAA
      AAAAAAAAAAAAAAAA

      BBBBBBBBBBBBBBBB

      BBBBBBBBBBBBBBBB
      BBBBBBBBBBBBBBBB
      BBBBBBBBBBBBBBBB

      BBBBBBBBBBBBBBBB
      BBBBBBBBBBBBBBBB
```

6.2 ECHO TESTS

These
 tests are designed as a test of the keyboard and an aid in iso-
lating troub
les within the terminal. At the beginning of each test,
the test number will
be printed indicating which test is being execut-
ed. Typing a 'RUBOUT'' or
'DELETE'' at any time, whether in keyboard
control or not, will exit the current
 Echo test and print a test ter-
mination message. If in keyboard control
, the select test message
will be printed and the program will await a test sel
ection as usual.
In switch register control, the program will halt (at SELLHLT
) waiting
for control via the switch register. A detailed description of eac
h
test follows:

6.2.1 Test 20 - Character Echo Test

This test is de
signed to operate the terminal in a simulated local
mode. Any character ty
ped on the keyboard (except a ''rubout'') will be
echoed to the printer.

If th
e LA36 terminal is in half duplex with the Auto Line Feed Option
available, t
yping a carriage return may cause a garbled response on
the terminal during t
his test.

6.2.2 Test 21 - Line Echo Test, Fast Rate

This test contin
ually sends full lines of any character up to the max-
imum column width. The
test prints a ''0'' character when started until
a key is typed on the keyboard.
 The program will then send the typed
character until another character is t
yped or the test is terminated
by typing a ''rubout''. The characters are transm
itted at the maximum
rate with a carriage return-line feed inserted after

every 132(10)
printable characters.

If the LA36 is in half duplex when runn
ing this test, characters may
be lost or garbled whenever a character is type
d on the keyboard.

With the Auto Line Feed Option set to produce an automatic
line feed
after every carriage return, there will be a blank line between
each
printed line.

6.2.3 Test 22 - Line Echo Test, Slow Rate

This te
st is identical to Test 21 except a delay of 1.8 seconds is
inserted betwe
en each character to allow the print head to perform an
LCV between characters.

6.2.4 Test 23 - Character/Code Echo Test

This test will print the octal c
ode received by the processor followed
by the character or the mnemonic of the
character every time a key is
pressed on the keyboard. The parity of the rece
ived code will be in-
dicated as either odd or even. Allow sufficient time
between char-
acters for the line to be printed.

With the Auto Line Feed Op
tion set to produce an automatic line feed
after every received carriage
return, there will be a blank line
between each printed line.

EXAMPLE:

```
          301   A      ODD
          263   3      ODD
          215   CR     E
VEN
          240   SP     EVEN
```

6.2.5 Test 24 - Selected Pattern Echo Tes
t

This test is designed to give maintenance the flexibility to choose
the
ir own patterns for isolating any specific problems which may arise
in the fiel
d.

Type any characters (except control-C and rubout) and each character
wi
ll be echoed as typed. A maximum of 256(10) characters may be in-
putted. N
o carriage returns or line feeds are inserted by the pro-
gram, all charac
ters must be inputted by the operator. To terminate
the input string type a co
ntrol-C, the program will then continually
echo the inputted pattern. To sto
p the printing, type control-C. The
program will stop printing the pattern and
will wait for either anoth-
er pattern input terminated by a control-C, or the
same pattern may be
used again by typing control-C. To exit the test at any t
ime, type a
''rubout''.

When any options are available, be careful what char
acters or char-
acter sequences are selected.

6.2.6 Test 25 - Bell Echo Test

This test is designed to test the bell on column 64 if typing has oc-

curred on the line. The test prints a message:

```
     TYPE ANY PRINTABLE CHAR
ACTER AND LISTEN FOR BELL .....
```

After the test message is printed, typ
e any printable character on the
keyboard. The character will be echoed and th
e bell should ring. The
message will then be typed again. Type the "rubout" k
ey to terminate
the test at any time.

6.4 STANDARD I/O TESTS

These tests
 are designed as a brief check of the console terminal in-
terface logic. E
ach check is structured as an independent test and
the switch register control
s may be used. A description of each test
is given in the program listing.
  Any errors encountered during the
I/O tests will cause a halt at location 'ER
RHLT'' if switch 14 is down.

SEQ 0044

CZLACE0 LA36 TERM (DL11 & KL11) MACRO M1110 25-AUG-78 10:13
TABLE OF CONTENTS

SEQ 0045

```
                        .TITLE  CZLACE0 LA36 TERM (DL11 & KL11)
;
;LA36 DIAGNOSTIC (DL11 & KL11 INTERFACE)
;
;
;AUTHORS:    ROBERT W. BAKER
;            R. QUENNEVILLE
;            RALPH A. SCHAUBER
;            JOHN V. CHATALIAN
;
;
;COPYRIGHT 1974,1977,1978  DIGITAL EQUIPMENT CORP., MAYNARD, MASS. 01754


                        .SBTTL  SWITCH REGISTER OPTIONS
;
;SWITCH          POSITION        FUNCTION
;
;  15            UP (1)          HALT AT COMPLETION OF CURRENT TEST
;                DOWN (0)        CONTINUE NORMAL TEST SEQUENCE
;
;  14            UP (1)          CONTINUE ON ERROR
;                DOWN (0)        HALT ON ERROR
;
;  13            UP (1)          DRIVE ONLY CONSOLE TERMINAL
;                DOWN (0)        DRIVE ALL TERMINALS
;
;  11            UP (1)          LOOP ON INDIVIDUAL TEST
;                DOWN (0)        NORMAL TEST SEQUENCE
;
;  09            UP (1)          CPU TYPE IS AN LSI-11, PDP-11/03
;                DOWN (0)        ALL OTHER PDP-11 CPU'S
;
;  08            UP (1)          HALT TO SELECT TEST AT END OF CURRENT TEST
;                DOWN (0)        LOOP ON TEST SEQUENCE
;
;05-00                           TEST # SELECTION
;
;07-00                           # OF COLUMNS AT START-UP
```

```
                                .SBTTL  SPECIAL OPERATIONAL INFORMATION
                        ;
                        ;1.--   THE STANDARD CONSOLE TERMINAL INTERRUPT VECTOR AND REGISTER
                        ;       ADDRESSES ARE USED. TO REDEFINE THE LOCATION OF THE CONSOLE
                        ;       TERMINAL THE SYMBOLIC LOCATIONS ''CONADD'' AND ''CONVEC'' SHOULD
                        ;       BE CHANGED BEFORE START UP.
                        ;
                        ;2.--   BEFORE START UP REFER TO THE DESCRIPTION OF THE ROUTINE ''DLY''.
                        ;       TIMING IS A FUNCTION OF THE PDP-11 MODEL AND MEMORY TYPE AND
                        ;       SHOULD BE SET UP BEFORE RUNNING THE DIAGNOSTIC.
                        ;
                        ;3.--   IF CPU IS A PDP-11/03 , LSI-11 SET SWITCH REGISTER
                        ;       BIT 09 TO A 1. SPECIAL TESTS ARE RUN ON THE DLV11.
                        ;
                        ;4.--   SYSTEMS WITHOUT A HARDWARE SWITCH REGISTER SHOULD USE
                        ;       MEMORY LOCATION 176 AS A SOFTWARE SWITCH REGISTER.
                        ;
                        ;5.--   THIS DIAGNOSTIC IS FOR VERIFICATION OF BASIC TERMINAL
                        ;       FUNCTIONS ONLY. IF THE TERMINAL UNDER TEST HAS HARDWARE
                        ;       OPTIONS INSTALLED RUN DIAGNOSTIC MAINDEC-11-DZLAF-A, THE
                        ;       LA36 TERMINAL OPTIONS TEST.
```

```
                                        .SBTTL  SYSTEM EQUATES
                                ;
                                ;
                                ;       REGISTER EQUATES
                                ;
000000                          R0=%0
000001                          R1=%1
000002                          R2=%2
000003                          R3=%3
000004                          R4=%4
000005                          R5=%5
000006                          SP=%6
000007                          PC=%7
177776                          PSW=177776
                                ;
                                ;       SYSTEM EQUATES
                                ;
000001                          BIT0=1
000002                          BIT1=2
000004                          BIT2=4
000010                          BIT3=10
000020                          BIT4=20
000040                          BIT5=40
000100                          BIT6=100
000200                          BIT7=200
000400                          BIT8=400
001000                          BIT9=1000
002000                          BIT10=2000
004000                          BIT11=4000
010000                          BIT12=10000
020000                          BIT13=20000
040000                          BIT14=40000
100000                          BIT15=100000
000000                          OPEN=0
040000                          SCOPSW=BIT14            ;SCOPE SWITCH
004000                          NITRSW=BIT11            ;TEST LOOP SWITCH
005726                          POPSP=5726              ;POP STACK ONCE
022626                          POPSP2=22626            ;POP STACK TWICE
000340                          PRTY7=340               ;PRIORITY LEVEL DEFINITIONS
000200                          PRTY4=200
000200                          ACRLF=200
001000                          LSI11=BIT9              ;FLAG FOR LSI-11,11/03
                                ;
                                ;       PROGRAM TRAP EQUATES
                                ;
104000                          TYPE=EMT+0
104001                          ERROR=EMT+1
104002                          EHALT=EMT+2
104003                          STRDRV=EMT+3
104004                          STPCHV=EMT+4
104005                          CHAIN=EMT+5
104006                          CHALT=EMT+6
104007                          TYPEM=EMT+7
104010                          DELAY=EMT+10
104011                          TTYCTL=EMT+11
104012                          CRLF=EMT+12
104013                          SCRLF=EMT+13
```

```
  12400           104014                  LF=EMT+14
  12500           104015                  PRINTC=EMT+15
  12600           104016                  PRTHDR=EMT+16
  12700           104017                  PRNT=EMT+17
  12800           104020                  READ=EMT+20
  12900           104021                  AREAD=EMT+21
  13000           104022                  CR=EMT+22
  13100           104023                  BTOASC=EMT+23
  13200           104024                  FORWD=EMT+24
  13300           104025                  READC=EMT+25
```

```
                                        .SBTTL  TRAP CATCHER & STARTING ADDRESSES
                                ;
                                        .ENABL  ABS,AMA
                                        .ASECT
                                
                                        .=0
                                
000000  000002                          .+2                     ;UNASSIGNED TRAP
000002  000000                          HALT
000004  000006                  MACHER: .+2                     ;SP OVERFLOW, BUS ERROR TRAP
000006  000000                          HALT
000010  000012                          .+2                     ;RESERVED INSTRUCTION TRAP
000012  000000                          HALT
000014  000016                          .+2                     ;TRACE TRAP
000016  000000                          HALT
000020  000022                          .+2                     ;TRAP TO CALL IOX
000022  000000                          HALT
000024  000026                          .+2                     ;POWER FAIL TRAP
000026  000000                          HALT
000030  002722                          EMTINT                  ;EMT TRAP
000032  000340                          PRTY7
                                
                                        .=42
                                
000042  000000                          0
                                
                                        .=46
                                
000046  011522                          LOGICAL
                                
                                        .=52
                                
000052  010000                          010000
                                
                                        .=174
                                
000174  000000                  DISPREG:        .WORD   0       ;SOFTWARE DISPLAY
000176  000000                  SWREG:          .WORD   0       ;SOFTWARE SWITCH REGISTER
                                
000200  000167  000604                  JMP     START           ;START UP WITH I/O TESTS RUNNING
000204  000167  000526                  JMP     START1          ;START UP, SKIP ALL I/O TESTS
000210  000167  000540                  JMP     START2          ;START UP TERMINAL CONTROL WITH I/O TESTS
000214  000167  000552                  JMP     START3          ;START UP TERMINAL CONTROL WITHOUT I/O TESTS
                                
                                
                                        .=600
                                
000600  000000                  SPBOT:  0                       ;BOTTOM OF STACK
```

```
                                        .SBTTL  SYMBOL DEFINITIONS
                                ;
                                ;
                                ;
000602  177560                CONADD: 177560          ;ADDR OF CONSOLE RECEIVER STATUS REG
000604  000060                CONVEC: 60              ;CONSOLE TERMINAL INTERRUPT VECTOR
000606  176500                DLADR:  176500          ;ADDRESS OF FIRST DL11, DEFAULT TO DL11-A,B
                                                        ;IF DL11-C,D,E,, THEN
                                                        ;SET TO 175610 FOR FIRST 16 (OF 31) OR
                                                        ;SET TO 176000 FOR LAST 16 (OF 31)
                                                        ;OR SET OTHER DESIRED START ADDRESS
000610  000020                DLNR:   16.             ;# OF DL11'S TO BE INITIALLY ASSUMED
000612  177560                TKS:    177560          ;CONSOLE RECEIVER STATUS REG
000614  177562                TKB:    177562          ;CONSOLE RECEIVER BUFFER
000616  177564                TPS:    177564          ;CONSOLE TRANSMITTER STATUS REG
000620  177566                TPB:    177566          ;CONSOLE TRANSMITTER BUFFER
000622  000060                TKVTR:  60              ;C.T. RECEIVER INTERRUPT VECTOR
000624  000200                TKLVL:  PRTY4           ;C.T. RECEIVER PRIORITY LEVEL
000626  000064                TPVTR:  64              ;C.T. TRANSMITTER INTERRUPT VECTOR
000630  000200                TPLVL:  PRTY4           ;C.T. TRANSMITTER PRIORITY LEVEL
000632  000000                FSTDL:  OPEN            ;ADDRESS OF FIRST ACTIVE DL11
000634  000000                CNTLSW: OPEN            ;CONSOLE TERMINAL CONTROL SWITCH
000636  000000                RTNNO:  OPEN            ;CONTAINS CURRENT TEST NUMBER
000640  000000                NXTST:  OPEN            ;CONTAINS ADDRESS OF NEXT TEST
000642  000000                SCOPTR: OPEN            ;CONTAINS ADDRESS OF TEST SCOPE ENTRY
000644  000000                PRGID:  OPEN            ;CONTAINS TEST PROGRAM INDICATORS
000646  000000                CRBUF:  OPEN
000650  000000                CTRA:   OPEN
000652  000000                WIDTH:  OPEN            ;CURRENT PAPER WIDTH, BINARY
000654  000000                LEVEL:  OPEN            ;LEVEL OF EXECUTION
000656  000000                DLCNT:  OPEN            ;# OF MULTIPLE DL11S
000660  000000                ICTR:   OPEN            ;I/O TEST ITERATION COUNT
000662  000000                REPT:   OPEN            ;TEMP STORAGE FOR TESTS E021 & E022
000664  000000                BRCTR:  OPEN            ;COUNTER FOR ROUTINE ''AREAD''
000666  000000                COUNT3: OPEN            ;COUNTER FOR ROUTINE 'PRINTC''
000670  000000                XCSR:   OPEN            ;ADDRESS OF MULTIPLE DL11 STATUS
000672  000251                TIMER:  251             ;1 MSEC COUNTER FOR ROUTINE 'DELAY''
000674  000000                SPCNT:  OPEN            ;COUNTER FOR TEST ROUTINE 'PT3''
000676  000000                CURTST: OPEN            ;ADDRESS OF CURRENT TEST
000700  000000                TEMPCH: OPEN            ;TEMP STOR FOR ECHO TESTS
000702  000000                PARITY: OPEN            ;PARITY FLAG FOR RECEIVED CHAR
000704  000000                PCHAR:  OPEN            ;CHAR CODE WITH PARITY BIT
000706  000000                LFCNT:  OPEN            ;COUNTER FOR TEST ROUTINE 'PT4''
000710  000000                INCHK:  OPEN            ;CHECK FOR INPUT FLAG
000712  000000                TEMP:   OPEN            ;TEMPORARY WORKING STORAGE
000714  177570                SR:     177570          ;SW REG ADDRESS
000716  000000                CNTR:   OPEN            ;TIME COUNTER FOR LSI-11 TESTS
```

```
23900
```

```
                                        .SBTTL  PROGRAM INITIALIZATION & CONTROL

                                ;********
                                ;COMMON HALT---WHEN IN SWITCH REGISTER CONTROL THE CPU
                                ;       WILL BE ADVANCED TO THIS COMMON HALT WHERE
                                ;       A NEW TEST WILL BE EXPECTED TO BE STARTED
                                ;********

000720  005767  177730        CHLT:   TST     LEVEL           ;TEST CURRENT LEVEL
000724  001403                        BEQ     SELHLT          ;BRANCH IF 0, DO NOT HALT
000726  011600                        MOV     @SP,R0          ;PUT ADDRESS OF CALLER INTO R0
000730  005740                        TST     -(R0)
000732  000000                        HALT
000734  000002                SELHLT: RTI                     ;RETURN FROM INTERRUPT
000736  012767  177777  004324 START1: MOV     #177777,ATOX    ;FORCE END OF I/O TESTS
000744  012767  104006  000726        MOV     #CHALT,WAITF    ;FORCE SR CONTROL
000752  000424                        BR      STARTX
000754  012767  104011  000716 START2: MOV     #TTYCTL,WAITF   ;FORCE TERMINAL CONTROL
000762  012767  005320  004300        MOV     #AT1,ATOX       ;FORCE ALL I/O TESTS
000770  000415                        BR      STARTX
000772  012767  104011  000700 START3: MOV     #TTYCTL,WAITF   ;FORCE TERMINAL CONTROL
001000  012767  177777  004262        MOV     #177777,ATOX    ;FORCE END OF I/O TESTS
001006  000406                        BR      STARTX
001010  012767  005320  004252 START:  MOV     #AT1,ATOX       ;FORCE ALL I/O TESTS
001016  012767  104006  000654        MOV     #CHALT,WAITF    ;FORCE SR CONTROL
001024  012706  000600        STARTX: MOV     #SPBOT,SP       ;SET STACK POINTER
001030  016746  176752                MOV     6,-(SP)         ;SAVE CURRENT VECTOR
001034  016746  176744                MOV     4,-(SP)
001040  012767  001054  176736        MOV     #10$,4          ;SET UP TIMEOUT VECTOR
001046  005777  177642                TST     @SR             ;TRY TO REFERENCE HARDWARE SW REG
001052  000411                        BR      11$             ;BRANCH IF NO TIMEOUT TRAP OCCURS
001054  012767  000176  177632 10$:   MOV     #SWREG,SR       ;POINT TO SOFTWARE SWITCH REGISTER
001062  022626                        CMP     (SP)+,(SP)+     ;RESTORE STACK
001064  104000                        TYPE                    ;TELL OPERATOR TO USE SOFTWARE
001066  014424                        NOSWR                   ;SWITCH REG AT LOC 176
001070  012767  000202  177574        MOV     #202,TIMER      ;ADJUST TIMER FOR LSI-11
001076  012667  176702        11$:    MOV     (SP)+,4         ;RESTORE TIMEOUT VECTOR
001102  012667  176700                MOV     (SP)+,6
001106  005067  177576                CLR     INCHK           ;ALLOW INPUT CHECKING
001112  012767  000006  176664        MOV     #6,MACHER       ;CLEAN UP
001120  005067  177520                CLR     PRGID           ;INITIALIZE PROGRAM FLAGS
001124  005067  177504                CLR     CNTLSW          ;INITIALIZE TERMINAL CONTROL SWITCH
001130  005067  177520                CLR     LEVEL           ;INITIALIZE LEVEL
001134  012767  003460  176662        MOV     #PFAIL,24       ;SET ADDR POWER FAIL ROUTINE
001142  004767  002542                JSR     PC,CONIT        ;SET UP CONSOLE TERMINAL ADDRESS
```

```
                                ;**********
                                ;READ THE PAPER WIDTH, NUMBER OF COLUMNS,
                                ;FROM SWITCH REGISTER POSITIONS 0-7. SAVE AND
                                ;CONVERT TO 3 ASCII CHARACTERS. A WIDTH GT132
                                ;OR LT30 COLUMNS (DECIMAL) WILL BE ABORTED TO 132.
                                ;THE SWITCHES MAY BE CHANGED ONCE THE PROGRAM TITLE OR THE DL11 COUNT
                                ;MESSAGE HAS STARTED TO PRINT.
                                ;**********

001146  017701  177542            MOV     @SR,R1          ;PUT (SR) INTO R1
001152  042701  177400            BIC     #177400,R1      ;SAVE ONLY BITS 0-7
001156  020127  000204            CMP     R1,#204         ;TEST NO. COLUMN GT132
001162  003003                    BGT     2$              ;COLUMNS GT132, DEFAULT TO 132
001164  020127  000035    1$:     CMP     R1,#35          ;CHECK IF NO. COLUMNS LT 30
001170  101002                    BHI     3$              ;NOT LT 30 NOR GT 132
001172  012701  000204    2$:     MOV     #204,R1         ;COLUMNS LT 30 OR GT 132, DEFAULT
001176  010167  177450    3$:     MOV     R1,WIDTH        ;SAVE NO. COLUMNS IN WIDTH
001202  012700  014127            MOV     #HDR0,R0        ;ADDR TO STORE ASC11 COLUMN VALUE
001206  012702  000003            MOV     #3,R2           ;DO A 3 CHAR. CONVERSION
001212  104023                    BTOASC                  ;CONVERT NO. COLUMNS TO ASCII
001214  000401    4$:     BR      5$
001216  000410            BR      6$
001220  012700  000000    5$:     MOV     #0,R0           ;TRANSMIT A
001224  104015                    PRINTC                  ;NULL CODE
001226  104007                    TYPEM                   ;TYPE PROGRAM TITLE FIRST TIME RUN
001230  013676                    STARTM
001232  012767  000240  177754    MOV     #NOP,4$
```

```
                                        ;**********
                                        ;THIS NEXT PART CHECKS THE PRESENCE OF DL11-A OR DL11-C
                                        ;STARTING AT 776500. A MESSAGE WILL BE PRINTED INDICATING THE NUMBER
                                        ;PRESENT. THE PRINTER DIAGNOSTIC WILL ADDRESS EACH OF
                                        ;THE MULTIPLE DL11S IN THE SYSTEM IF SWITCH 13 IS DOWN (0).
                                        ;**********

001240  012767  001320  176536  6$:     MOV     #END2A,MACHER   ;INITIALIZE TIME OUT TRAP
001246  016700  177334                  MOV     DLADR,R0        ;ADDRESS OF FIRST DL11 TO R0
001252  016701  177332                  MOV     DLNR,R1         ;SET DL CHECK COUNT
001256  005067  177374                  CLR     DLCNT           ;INITIALIZE DLCNT
001262  005710                  END3:   TST     (R0)            ;IS DL PRESENT?
001264  012767  001332  176512          MOV     #END2,MACHER    ;YES, RESET TIME OUT TRAP
001272  010067  177334                  MOV     R0,FSTDL        ;STORE ADDRESS OF FIRST DL11
001276  000401                          BR      2$              ;CONTINUE
001300  005710                  1$:     TST     (R0)            ;IS DL11 PRESENT
001302  062700  000010          2$:     ADD     #10,R0          ;POINTER AND DL11 ADDRESS
001306  005267  177344                  INC     DLCNT           ;INCREMENT COUNT OF DL11'S
001312  005301                          DEC     R1              ;DECREMENT DL CHECK COUNT, DONE?
001314  001407                          BEQ     END4            ;BRANCH IF DONE
001316  000770                          BR      1$              ;CHECK PRESENCE OF NEXT DL11
001320  005301                  END2A:  DEC     R1              ;DONE DL CHECK?
001322  001404                          BEQ     END4            ;YES, EXIT
001324  062700  000010                  ADD     #10,R0          ;NO, CHECK NEXT DL
001330  000754                          BR      END3            ;CONTINUE
001332  022626                  END2:   POPSP2                  ;DL11 NOT PRESENT
001334  016701  177316          END4:   MOV     DLCNT,R1        ;GET # DL11'S
001340  012700  014064                  MOV     #DL11S1,R0      ;ADR OF ASCII CHAR STORAGE
001344  012702  000002                  MOV     #2,R2           ;# OF ASCII CHARS
001350  104023                          BTOASC                  ;CONVERT NUMBER
001352  104007                          TYPEM                   ;TYPE MESSAGE
001354  014051                          DL11S

                                        ;**********
                                        ;EXECUTE THE STRING OF CONSOLE TERMINAL I/O TESTS
                                        ;THEN EITHER HALT AT LOCATION SELHLT OR CONTINUE WITH
                                        ;PRINTER TESTS AS A FUNCTION OF SR BIT 8.
                                        ;**********

001356  005067  177254                  CLR     RTNNO           ;SET ROUTINE NO = 0
001362  005067  177266                  CLR     LEVEL           ;SET LEVEL = 0
001366  026727  003676  177777          CMP     ATOX,#177777    ;SEE IF I/O IS TO BE SKIPPED
001374  001515                          BEQ     SKIP
001376  012767  005266  177234          MOV     #AT0,NXTST      ;ADDRESS OF FIRST I/O TEST
001404  104024                          FORWD                   ;SET UP TEST PARAMETERS
001406  000177  177264                  JMP     @CURTST         ;GO TO I/O TEST ROUTINE
```

```
                                ;**********
                                ;CHAINN--   THIS PORTION IS THE COMMON RETURN
                                ;          FOR ALL THREE CLASSES OF TESTS.
                                ;
                                ;       1--IF AN ERROR OCCURRED DURING AN I/O TEST THE
                                ;          OPERATOR CAN CAUSE THAT TEST TO BE LOOPED
                                ;          WITHOUT ANY FURTHER ERROR HALTS BY
                                ;          SETTING THE "SCOPE" BIT (#14) ON THE SR=1.
                                ;          RESETTING SR BIT 14 TO 0 WILL ALLOW THE
                                ;          ERROR HALT TO OCCUR AGAIN IF IT STILL EXISTS.
                                ;
                                ;       2--IF THE OPERATOR IS IN THE MAINTENANCE
                                ;          MODE (BIT 8 SET = 1 AT START UP TIME), THE
                                ;          SELECTED PROGRAM WILL LOOP CONTINUOUSLY
                                ;          IF SR BIT 11 IS SET=1. IF BIT 11 IS = 0
                                ;          THEN THE PROGRAM WILL BE ADVANCED TO
                                ;          THE NEXT TEST IN IT'S CLASS IF BIT 8=0.
                                ;          AS LONG AS BIT 11 AND
                                ;          BIT 8 ARE 0, THE CLASS OF TESTS SELECTED
                                ;          WILL BE CONTINUOUSLY SEQUENCED THROUGH.
                                ;          IF BIT 11 IS 0 AND BIT 8=1, THEN THE CPU
                                ;          WILL HALT AT LOCATION SELHLT AND WAIT FOR THE
                                ;          NEXT TEST NUMBER TO BE SET IN THE
                                ;          SWITCH REGISTER.
                                ;**********
001412  032767  000001  177214  CHAINN: BIT     #1,CNTLSW       ;CHECK IF TERMINAL CONTROL
001420  001401                          BEQ     1$              ;BRANCH IF NOT
001422  104011                          TTYCTL                  ;GO TO TERMINAL CONTROL
001424  005767  177214          1$:     TST     PRGID           ;TEST ERROR BIT IN PRGID
001430  100016                          BPL     3$              ;BRANCH IF ERROR BIT NOT SET
001432  032777  040000  177254          BIT     #SCOPSW,@SR     ;ERROR, CHECK IF SCOPE OPTION ON
001440  001407                          BEQ     2$              ;BRANCH IF NO SCOPING
001442  022767  177777  177172          CMP     #-1,SCOPTR      ;YES, CHECK IF OK TO SCOPE THIS TEST
001450  001403                          BEQ     2$              ;BRANCH IF NOT OK
001452  017716  177164                  MOV     @SCOPTR,@SP     ;PUT ADDR OF SCOPE ENTRY INTO STACK
001456  000002                          RTI                     ;GO TO SCOPE ENTRY IN TEST
001460  042767  100000  177156  2$:     BIC     #BIT15,PRGID    ;CLEAR ERROR IND. IN PRGID
001466  005767  177162          3$:     TST     LEVEL           ;CHECK LEVEL
001472  001405                          BEQ     4$              ;BRANCH IF LEVEL=0
001474  032777  004000  177212          BIT     #NITRSW,@SR     ;TEST LOOP SWITCH ON (=1)
001502  001405                          BEQ     5$              ;BRANCH IF NO LOOP TEST
001504  000002                          RTI                     ;GO BACK TO TEST
001506  005367  177146          4$:     DEC     ICTR            ;DECREMENT TEST ITERATION COUNT
001512  001407                          BEQ     6$              ;BRANCH IF COUNT=0
001514  000002                          RTI                     ;NOT ZERO, REPEAT TEST
001516  032777  000400  177170  5$:     BIT     #BIT8,@SR       ;TEST IF SEQUENCE TEST (BIT8)
001524  001402                          BEQ     6$              ;BRANCH TO NEXT TEST IF BIT8=0
001526  000167  000146                  JMP     WAITF           ;GO WAIT FOR MORE INPUT
001532  022626                  6$:     POPSP2                  ;POP 2 OFF STACK
001534  000240                  CHAINY: NOP                     ;THIS FORMERLY WAS RESET
001536  005777  177152                  TST     @SR             ;CHECK SR
001542  100003                          BPL     1$              ;BRANCH IF NO HALT WANTED
001544  116700  177066                  MOVB    RTNNO,R0        ;CURRENT TEST NUMBER TO R0
001550  000000                          HALT                    ;HALT (NOT FOR TEST SELECTION)
001552  005767  177076          1$:     TST     LEVEL           ;TEST THE CURRENT LEVEL
001556  001420                          BEQ     3$              ;BRANCH IF 0
```

```
 17900 001560  012767  000006  176216          MOV     #6,MACHER       ;CLEAN UP
 18000 001566  012706  000600                  MOV     #SPBOT,SP       ;SET UP STACK POINTER
 18100 001572  104024                          FORWD                   ;SET UP VALUES FOR NEXT TEST
 18200 001574  022767  177777  177036          CMP     #-1,NXTST       ;END OF I/O TESTS (=-1)
 18300 001602  001004                          BNE     2$              ;BRANCH IF NOT END
 18400 001604  012767  005266  177026          MOV     #AT0,NXTST      ;RESET NXTST TO FIRST I/O TEST
 18500 001612  104024                          FORWD                   ;SET UP VALUES FOR NEXT TEST
 18600 001614  000177  177056        2$:       JMP     @CURTST         ;GO TO TEST
 18700 001620  022767  177777  177012  3$:     CMP     #-1,NXTST       ;END OF I/O TESTS (=-1)
 18800 001626  001012                          BNE     NEXT            ;BRANCH IF NOT
 18900 001630  032777  000400  177056  SKIP:   BIT     #BIT8,@SR       ;TEST IF WANT TEST SELECTION RIGHT AWAY
 19000 001636  001016                          BNE     NEXT1           ;BRANCH IF NOT
 19100 001640  052767  000200  176776          BIS     #BIT7,PRGID     ;BYPASS SCOPING
 19200 001646  012767  007372  176764          MOV     #PT0,NXTST      ;PROD TESTING, GO TO PRINTER TESTS
 19300 001654  012767  000006  176122  NEXT:   MOV     #6,MACHER       ;CLEAN UP
 19400 001662  012706  000600                  MOV     #SPBOT,SP       ;SET UP STACK POINTER
 19500 001666  104024                          FORWD                   ;SET UP NEXT TEST PARAMETERS
 19600 001670  000177  177002                  JMP     @CURTST         ;GO TO ROUTINE
 19700 001674  005267  176754          NEXT1:  INC     LEVEL
 19800
 19900                                 ;**********
 20000                                 ;WAIT FOR FURTHER INSTRUCTIONS:
 20100                                 ;       -LOAD PROGRAM NUMBER INTO BITS 0-5 OF THE SR
 20200                                 ;       -SET SR BIT 11=1 TO LOOP ON SELECTED TEST
 20300                                 ;       -SET SR BIT 11=0 AND BIT 8=0 TO LOOP THROUGH
 20400                                 ;        SEQUENCE OF SELECTED TESTS.
 20500                                 ;       -SET SR BIT 11=0 AND BIT 8=1 TO HALT AGAIN AFTER
 20600                                 ;        EXECUTING TEST ONCE
 20700                                 ;**********
 20800
 20900 001700  104006          WAITF:  CHALT                           ;OR TTYCTL IF START WAS AT 210
 21000 001702  012767  000006  176074          MOV     #6,MACHER       ;CLEAN UP
 21100 001710  012706  000600                  MOV     #SPBOT,SP       ;SET UP STACK POINTER
 21200 001714  017700  176774                  MOV     @SR,R0          ;GET CURRENT SW REG
 21300 001720  042700  177700                  BIC     #177700,R0
 21400 001724  020027  000037                  CMP     R0,#37          ;TEST IF PROG NO. IS I/O TEST
 21500 001730  101403                          BLOS    1$              ;BRANCH IF EQ OR LT 37. AN ECHO OR PRINTER
 21600 001732  005067  176706                  CLR     PRGID           ;I/O TEST, CLEAR PRGID
 21700 001736  000403                          BR      2$
 21800 001740  052767  000200  176676  1$:     BIS     #BIT7,PRGID     ;BYPASS SCOPING
 21900 001746  000241                  2$:     CLC                     ;CLEAR C BIT
 22000 001750  006100                          ROL     R0              ;GET PROGRAM ADDRESS OUT OF
 22100 001752  016067  002522  176660          MOV     PRGTAB(R0),NXTST;PROGRAM ADDRESS TABLE
 22200 001760  026727  176654  001700          CMP     NXTST,#WAITF    ;TEST IF LEGAL TEST NO.
 22300 001766  001744                          BEQ     WAITF           ;BRANCH IF ILLEGAL
 22400 001770  104024                          FORWD                   ;SET UP TEST PARAMETERS
 22500 001772  000177  176700                  JMP     @CURTST         ;GO TO TEST
```

```
                                ;**********
                                ;TTY1-- THIS SECTION IS USED WHEN THE DIAGNOSTIC IS BEING CONTROLLED BY
                                ;       THE CONSOLE TERMINAL. IT IS EFFECTIVE ONLY WHEN THE DIAGNOSTIC
                                ;       STARTING ADDRESS IS 210 AND SR BIT 8 WAS SET AT START TIME.
                                ;       THE RESPONSE TO THE MESSAGE "SELECT TEST NO." MUST BE THE 2
                                ;       DIGIT OCTAL TEST NUMBER FOLLOWED BY :
                                ;               'L' TO LOOP ON TEST
                                ;               'S' TO LOOP ON SEQUENCE
                                ;               '.' TO EXECUTE TEST ONCE
                                ;       ALL SPACES WILL BE IGNORED. AN ILLEGAL INPUT WILL BE FLAGGED BY A '?'
                                ;       AND THE RETYPING OF THE ABOVE MESSAGE.
                                ;**********

001776  022626                  TTY1:   POPSP2                  ;POP 2 FROM STACK
002000  105777  176606                  TSTB    @TKS            ;TEST IF ANY INPUT
002004  100013                          BPL     1$              ;BRANCH IF NOT
002006  017705  176602                  MOV     @TKB,R5         ;GET CHAR
002012  042705  177600                  BIC     #177600,R5      ;MASK BITS
002016  020527  000177                  CMP     R5,#177         ;CHECK IF RUBOUT
002022  001004                          BNE     1$              ;BRANCH IF NOT
002024  042767  004400  176602          BIC     #4400,CNTLSW    ;CLEAR LOOP BITS
002032  000413                          BR      TTY1B
002034  032767  004000  176572  1$:     BIT     #NITRSW,CNTLSW  ;CHECK IF LOOP ON TEST
002042  001401                          BEQ     2$              ;BRANCH IF NO LOOP ON TEST
002044  000002                          RTI                     ;LOOP ON TEST
002046  032767  000400  176560  2$:     BIT     #BIT8,CNTLSW    ;TEST IF LOOP ON SEQUENCE
002054  001402                          BEQ     TTY1B           ;BRANCH IF NO LOOP ON SEQUENCE
002056  000167  177452                  JMP     CHAINY          ;CHAIN TO NEXT TEST
002062  012767  177777  176620  TTY1B:  MOV     #-1,INCHK       ;STOP INPUT CHECKING
002070  012700  000036                  MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
002074  104010                          DELAY
002076  104007                          TYPEM
002100  014341                          MESG3                   ;TYPE MESSAGE
002102  005067  176602                  CLR     INCHK           ;ALLOW INPUT CHECKING AGAIN
002106  104020                  1$:     READ                    ;WAIT FOR INPUT
002110  026727  176564  000040          CMP     TEMPCH,#40      ;TEST IF CHAR IS A SPACE
002116  001773                          BEQ     1$              ;BRANCH IF YES
002120  012700  000036                  MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
002124  104010                          DELAY
002126  104017                          PRNT                    ;READY?
002130  117777  176460  176462          MOVB    @TKB,@TPB       ;ECHO CHAR
002136  004767  000316                  JSR     PC,TESTC        ;CHECK IF CHAR IS OK
002142  000541                          BR      8$              ;NO, ERROR
002144  010005                          MOV     R0,R5           ;OK, PUT CHAR INTO R5
002146  006305                          ASL     R5              ;SHIFT INTO POSITION 5-3
002150  006305                          ASL     R5
002152  006305                          ASL     R5
002154  104020                  2$:     READ                    ;WAIT FOR NEXT CHAR
002156  026727  176516  000040          CMP     TEMPCH,#40      ;CHECK IF A SPACE
002164  001773                          BEQ     2$              ;BRANCH IF SPACE
002166  012700  000036                  MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
002172  104010                          DELAY
002174  104017                          PRNT                    ;READY?
002176  117777  176412  176414          MOVB    @TKB,@TPB       ;ECHO CHAR
002204  004767  000250                  JSR     PC,TESTC        ;CHECK IF CHAR IS OK
002210  000516                          BR      8$              ;ERROR IN CHAR
002212  060005                          ADD     R0,R5           ;OK,R5 NOW = OCTAL TEST NO.
```

```
28400 002214  104020                    3$:     READ                    ;WAIT FOR TERMINATION CHARACTER
28500 002216  026727  176456  000040            CMP     TEMPCH,#40      ;CHECK IF SPACE
28600 002224  001773                            BEQ     3$              ;BRANCH IF SPACE
28700 002226  012700  000036                    MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
28800 002232  104010                            DELAY
28900 002234  104017                            PRNT                    ;READY?
29000 002236  117777  176352  176354            MOVB    @TKB,@TPB       ;ECHO CHAR
29100 002244  012767  004001  176362            MOV     #4001,CNTLSW    ;SET BITS 11 & 0
29200 002252  026727  176422  000114            CMP     TEMPCH,#114     ;NO, IS IT AN 'L' ?
29300 002260  001427                            BEQ     5$              ;BRANCH IF YES
29400 002262  026727  176412  000154            CMP     TEMPCH,#154     ;CHECK LOWER CASE
29500 002270  001423                            BEQ     5$
29600 002272  026727  176402  000123            CMP     TEMPCH,#123     ;NO, IS IT AN 'S'
29700 002300  001414                            BEQ     4$              ;BRANCH IF YES
29800 002302  026727  176372  000163            CMP     TEMPCH,#163     ;CHECK LOWER CASE
29900 002310  001410                            BEQ     4$
30000 002312  026727  176362  000056            CMP     TEMPCH,#56      ;NO, IS IT A '.' ?
30100 002320  001052                            BNE     8$              ;NO, ERROR
30200 002322  012767  000001  176304            MOV     #1,CNTLSW       ;YES SET ONLY BIT 0 IN CONTROL WD
30300 002330  000403                            BR      5$
30400 002332  012767  000401  176274    4$:     MOV     #401,CNTLSW     ;SET BITS 8 & 0
30500 002340  012767  000006  175436    5$:     MOV     #6,MACHER       ;CLEAN UP
30600 002346  012706  000600                    MOV     #SPBOT,SP       ;INIT SP
30700 002352  020527  000040                    CMP     R5,#40          ;IS THIS AN I/O TEST
30800 002356  103033                            BHIS    8$              ;BRANCH IF YES
30900 002360  020527  000030                    CMP     R5,#30          ;IS THIS AN OPTION TEST?
31000 002364  103007                            BHIS    6$              ;SKIP IF YES
31100 002366  020527  000020                    CMP     R5,#20          ;IS THIS AN ECHO TEST
31200 002372  103404                            BLO     6$              ;BRANCH IF NOT
31300 002374  012767  000001  176232            MOV     #1,CNTLSW       ;FORCE ECHO TEST TO A SINGLE RUN
31400 002402  000402                            BR      7$              ;LEAVE THIS TERMINAL AS CONSOLE
31500 002404  004767  001300            6$:     JSR     PC,CONIT        ;RESET CONSOLE TERMINAL ADDRESS
31600 002410  052767  000200  176226    7$:     BIS     #BIT7,PRGID     ;BYPASS SCOPING
31700 002416  000241                            CLC                     ;CLEAR C BIT
31800 002420  006105                            ROL     R5
31900 002422  016567  002522  176210            MOV     PRGTAB(R5),NXTST;ADDR OF TEST TO NXTST
32000 002430  026727  176204  001700            CMP     NXTST,#WAITF    ;CHECK IF TEST EXISTS
32100 002436  001403                            BEQ     8$              ;BRANCH IF NOT
32200 002440  104024                            FORWD                   ;SET UP TEST PARAMETERS
32300 002442  000177  176230                    JMP     @CURTST         ;GO TO TEST
32400 002446  104017                    8$:     PRNT                    ;CHECK IF PRINTER IS READY
32500 002450  112777  000077  176142            MOVB    #77,@TPB        ;SEND A '?'
32600 002456  000601                            BR      TTY1B           ;TRY AGAIN
```

```
 32800                                  ;TESTC--CHECKS THAT THE INPUTTED CHARACTER IS BETWEEN 0 AND 7 INCLUSIVE
 32900
 33000 002460  026727  176214  000060  TESTC:  CMP     TEMPCH,#60      ;CHECK IF NUMERIC AND EQ OR GT 0
 33100 002466  103001                          BHIS    1$              ;BRANCH IF OK
 33200 002470  000207                          RTS     PC              ;ERROR RETURN
 33300 002472  026727  176202  000067  1$:     CMP     TEMPCH,#67      ;CHECK IF EQ OR LT 7
 33400 002500  101401                          BLOS    2$              ;BRANCH IF OK
 33500 002502  000207                          RTS     PC              ;ERROR RETURN
 33600 002504  062716  000002          2$:     ADD     #2,@SP          ;SET UP RETURN ADDRESS
 33700 002510  016700  176164                  MOV     TEMPCH,R0       ;GET CHAR
 33800 002514  042700  177770                  BIC     #177770,R0      ;SAVE ONLY THE DIGIT
 33900 002520  000207                          RTS     PC              ;NORMAL RETURN
```

```
34100 002522  007372                PRGTAB: PT0             ;DATA PATH TEST
34200 002524  007446                        PT1             ;PRINTER CHARACTER TEST
34300 002526  007570                        PT2             ;NON-PRINTING CHARACTER TEST
34400 002530  010164                        PT3             ;CARRIAGE RETURN TEST
34500 002532  010304                        PT4             ;MULTIPLE LINE FEED TEST
34600 002534  010462                        PT5             ;SINGLE LINE FEED TEST
34700 002536  010666                        PT6             ;BACKSPACE TEST
34800 002540  011054                        PT7             ;OVERPRINT TEST
34900 002542  011266                        PT10            ;PRINTING FREQUENCY SWEEP TEST
35000 002544  011424                        PT11            ;RIBBON FEED TEST
35100 002546  011456                        PT12            ;PRINTER BELL TEST
35200 002550  001700                        WAITF           ;SPARE
35300 002552  001700                        WAITF           ;SPARE
35400 002554  001700                        WAITF           ;SPARE
35500 002556  001700                        WAITF           ;SPARE
35600 002560  011546                        PT17            ;LIFE TEST
35700 002562  012116                        E020            ;CHARACTER ECHO TEST
35800 002564  012166                        E021            ;LINE ECHO TEST, FAST RATE
35900 002566  012224                        E022            ;LINE ECHO TEST, SLOW RATE
36000 002570  012476                        E023            ;CHARACTER/CODE ECHO TEST
36100 002572  013020                        E024            ;SELECTIVE PATTERN ECHO TEST
36200 002574  013566                        E025            ;BELL ECHO TEST
36300 002576  001700                        WAITF           ;SPARE
36400 002600  001700                        WAITF           ;SPARE
36500 002602  001700                        WAITF           ;SPARE
36600 002604  001700                        WAITF           ;SPARE
36700 002606  001700                        WAITF           ;SPARE
36800 002610  001700                        WAITF           ;PRARE
36900 002612  001700                        WAITF           ;SPARE
37000 002614  001700                        WAITF           ;SPARE
37100 002616  001700                        WAITF           ;SPARE
37200 002620  001700                        WAITF           ;SPARE
37300 002622  005266                        AT0             ;I/O TEST NO. 40
37400 002624  005320                        AT1             ;I/O TEST NO. 41
37500 002626  005352                        AT2             ;I/O TEST NO. 42
37600 002630  005404                        AT3             ;I/O TEST NO. 43
37700 002632  005436                        AT4             ;I/O TEST NO. 44
37800 002634  005526                        AT5             ;I/O TEST NO. 45
37900 002636  005604                        AT6             ;I/O TEST NO. 46
38000 002640  005674                        AT7             ;I/O TEST NO. 47
38100 002642  005744                        AT10            ;I/O TEST NO. 50
38200 002644  006002                        AT11            ;I/O TEST NO. 51
38300 002646  006042                        AT12            ;I/O TEST NO. 52
38400 002650  006116                        AT13            ;I/O TEST NO. 53
38500 002652  006176                        AT14            ;I/O TEST NO. 54
38600 002654  006262                        AT15            ;I/O TEST NO. 55
38700 002656  006362                        AT16            ;I/O TEST NO. 56
38800 002660  006430                        AT17            ;I/O TEST NO. 57
38900 002662  006500                        AT20            ;I/O TEST NO. 60
39000 002664  006572                        AT21            ;I/O TEST NO. 61
39100 002666  006672                        AT22            ;I/O TEST NO. 62
39200 002670  007000                        AT23            ;I/O TEST NO. 63
39300 002672  007112                        AT24            ;LSI TEST NO. 64
39400 002674  007212                        AT25            ;LSI TEST NO. 65
39500 002676  007270                        AT26            ;LSI TEST NO. 66
39600 002700  001700                        WAITF           ;SPARE
39700 002702  001700                        WAITF           ;SPARE
```

```
 39800 002704  001700                    WAITF                   ;SPARE
 39900 002706  001700                    WAITF                   ;SPARE
 40000 002710  001700                    WAITF                   ;SPARE
 40100 002712  001700                    WAITF                   ;SPARE
 40200 002714  001700                    WAITF                   ;SPARE
 40300 002716  001700                    WAITF                   ;SPARE
 40400 002720  001700                    WAITF                   ;SPARE
 40500
 40600                          ;**********
 40700                          ;EMTINT ------------SERVICE ROUTINE FOR TRAPS THROUGH
 40800                          ;                   LOCATION 30.
 40900                          ;**********
 41000
 41100 002722  011646           EMTINT: MOV     @SP,-(SP)       ;PUSH STACKED PC TO GET A WORK COPY.   (Q)
 41200 002724  162716  000002           SUB     #2,@SP          ;SUB 2 TO POINT TO CALLING TRAP INSTR.
 41300 002730  017616  000000           MOV     @(SP),@SP       ;PLACE TRAP INSTR INTO THIS STACK WORK AREA.
 41400 002734  121627  000035           CMPB    @SP,#35         ;EXAMINE ITS RIGHT SIDE.  (Q)
 41500 002740  101402                   BLOS    2$              ;BRANCH IF WITHIN RANGE OF ESTABLISHED TABLE.
 41600 002742  000000           1$:     HALT                    ;ELSE HALT.
 41700 002744  000776                   BR      1$
 41800 002746  006116           2$:     ROL     @SP             ;MULT INSTR BY 2 TO GET WORD DISPLACEMENT.
 41900 002750  042716  177001           BIC     #177001,@SP     ;STRIP OFF OP CODE AND LS BIT.
 42000 002754  062716  002776           ADD     #EMTTAB,@SP     ;ADD IN STARTING ADDRESS OF TABLE.
 42100 002760  017616  000000           MOV     @(SP),@SP       ;FROM TABLE GET OUT DESIRED POINTER.
 42200 002764  005046                   CLR     -(SP)           ;PUSH A ZERO PSW.
 42300 002766  012746  002774           MOV     #3$,-(SP)       ;PUSH A PC = TO #3$ OF THIS ROUTINE.
 42400 002772  000002                   RTI                     ;DO RTI (POP-POP) TO ESTABLISH THE ZERO PSW.
 42500 002774  000136           3$:     JMP     @(SP)+          ;JMP TO ROUTINE LEAVING STACK AS FOUND.
 42600
 42700 002776  003076           EMTTAB: TYP                     ;MESSAGE OUTPUT ROUTINE
 42800 003000  003320                   ERR                     ;I/O TEST ERROR ROUTINE
 42900 003002  003346                   EHLT                    ;UNCONDITIONAL HALT
 43000 003004  003356                   STLSRV                  ;KEYBOARD VECTOR/PRIORITY SETUP
 43100 003006  003406                   STLSPV                  ;PRINTER VECTOR/PRIORITY SETUP
 43200 003010  001412                   CHAINN                  ;COMMON TEST EXIT
 43300 003012  000720                   CHLT                    ;SR BIT 15 HALT
 43400 003014  003164                   TYPM                    ;MESSAGE OUTPUT ROUTINE, MULTI DEVICES
 43500 003016  003436                   DLY                     ;DELAY ROUTINE
 43600 003020  001776                   TTY1                    ;CONSOLE TERMINAL CONTROL
 43700 003022  003214                   $CRLF                   ;CARRIAGE RETURN-LINE FEED TO ALL DL11'S
 43800 003024  003142                   $SCRLF                  ;CARRIAGE RETURN-LINE FEED TO CONSOLE
 43900 003026  003216                   $LF                     ;LINE FEED ONLY (TO ALL)
 44000 003030  004324                   $PRTC                   ;PRINT CHAR
 44100 003032  003236                   $PRHDR                  ;PRINT TEST HEADER
 44200 003034  004314                   $PRNT                   ;PRINTER READY
 44300 003036  004112                   $READ                   ;READ CHAR
 44400 003040  003640                   $AREAD                  ;I/O TEST READ ROUTINE
 44500 003042  003226                   $CR                     ;CARRIAGE RETURN ONLY (TO ALL)
 44600 003044  004006                   $BTASC                  ;BINARY TO ASCII CONVERSION
 44700 003046  003562                   $FORWD                  ;FORWARD ROUTINE ( BETWEEN TESTS )
 44800 003050  004204                   $READC                  ;READ CONSOLE KYBD ONLY
 44900 003052  003072                   SPARET                  ;SPARE EMT
 45000 003054  003072                   SPARET                  ;SPARE EMT
 45100 003056  003072                   SPARET                  ;SPARE EMT
 45200 003060  003072                   SPARET                  ;SPARE EMT
 45300 003062  003072                   SPARET                  ;SPARE EMT
 45400 003064  003072                   SPARET                  ;SPARE EMT
```

```
 45500 003066  003072                          SPARET                  ;SPARE EMT
 45600 003070  003072                          SPARET                  ;SPARE EMT
 45700 003072  000000                  SPARET: HALT                    ;HALT IF TRAP TO UNDEFINED
 45800 003074  000776                          BR      SPARET          ;EMT IS ATTEMPTED.
 45900
 46000
 46100
 46200
 46300                                         .SBTTL  COMMON ROUTINES USED BY LA36 TESTS
 46400
 46500                                 ;**********
 46600                                 ;
 46700                                 ;THIS SECTION CONTAINS MOST ROUTINES CALLED BY
 46800                                 ;THE VARIOUS TESTS EITHER BY TRAPPING THROUGH LOCATION
 46900                                 ;30 OR BY SUBROUTINE CALLS (JSR PC,***)
 47000                                 ;
 47100                                 ;**********
 47200                                 ;
 47300                                 ;TYPE-- A COMMON ROUTINE USED TO TYPE MESSAGES ON THE
 47400                                 ;       CONSOLE TERMINAL ONLY. THE NULL CHARACTER TERMINATES
 47500                                 ;       THE MESSAGE. CALLED THROUGH AN EMT TRAP.
 47600                                 ;       CALLING SEQUENCE
 47700                                 ;       TYPE
 47800                                 ;       MESG    ;ADDRESS OF MESSAGE
 47900                                 ;
 48000                                 ;**********
 48100 003076  010046                  TYP:    MOV     R0,-(SP)        ;SAVE R0
 48200 003100  016601  000002                  MOV     2(SP),R1        ;GET POINTER TO ADDR. OF MESG.
 48300 003104  062766  000002  000002          ADD     #2,2(SP)
 48400 003112  011101                          MOV     (R1),R1         ;ADDR. OF MESG TO R1
 48500 003114  112100                  1$:     MOVB    (R1)+,R0        ;GET CHAR
 48600 003116  100403                          BMI     2$              ;BRANCH IF WANT AUTO CR-LF
 48700 003120  001004                          BNE     3$              ;PRINT CHAR IF NOT NULL
 48800 003122  012600                          MOV     (SP)+,R0        ;RESTORE R0
 48900 003124  000002                          RTI                     ;EXIT IF NULL CHAR
 49000 003126  104013                  2$:     SCRLF                   ;YES, SEND CR-LF
 49100 003130  000771                          BR      1$              ;GET NEXT CHAR
 49200 003132  104017                  3$:     PRNT                    ;PRINTER READY?
 49300 003134  110077  175460                  MOVB    R0,@TPB         ;LOAD PRINTER BUFFER WITH CHAR
 49400 003140  000765                          BR      1$              ;GO GET NEXT CHAR
 49500
 49600 003142  104017                  $SCRLF: PRNT                    ;PRINTER READY?
 49700 003144  112777  000015  175446          MOVB    #15,@TPB        ;SEND CR
 49800 003152  104017                          PRNT                    ;PRINTER READY?
 49900 003154  112777  000012  175436          MOVB    #12,@TPB        ;SEND LF
 50000 003162  000002                          RTI                     ;RETURN TO CALLER
```

```
                                        ;XXXXXXXXXX
                                        ;
                                        ;TYPM---MULTI TYPE-A COMMON ROUTINE TO OUTPUT
                                        ;       A MESSAGE ON ALL DL11S IF THE MULTI TEST
                                        ;       SWITCH (BIT 13) IS RESET. THIS ROUTINE IS USED BY
                                        ;       THE PRINTER TESTS TO TYPE HEADINGS.  IF A UNIT
                                        ;       IS NOT READY, THE CHARACTER WILL NOT BE TYPED.
                                        ;
                                        ;XXXXXXXXXX

003164  011601              TYPM:   MOV     (SP),R1         ;GET POINTER TO ADDR OF MESG
003166  062716  000002              ADD     #2,@SP
003172  011101                      MOV     (R1),R1         ;ADDR OF MESG TO R1
003174  112100              1$:     MOVB    (R1)+,R0        ;GET CHAR
003176  100402                      BMI     2$              ;BRANCH IF WANT AUTO CR-LF
003200  001003                      BNE     3$              ;CONTINUE IF NOT NULL
003202  000002                      RTI                     ;RETURN
003204  104012              2$:     CRLF                    ;YES, SEND CR-LF
003206  000772                      BR      1$              ;NEXT CHAR
003210  104015              3$:     PRINTC                  ;PRINT CHAR
003212  000770                      BR      1$              ;GO GET NEXT CHAR.

003214  104022              $CRLF:  CR                      ;SEND CR
003216  012700  000012      $LF:    MOV     #12,R0          ;SET LF CHAR
003222  104015                      PRINTC                  ;SEND IT
003224  000002                      RTI                     ;RETURN TO CALLER

003226  012700  000015      $CR:    MOV     #15,R0          ;SET CR CHAR
003232  104015                      PRINTC                  ;SEND IT
003234  000002                      RTI                     ;RETURN

                                        ;**********
                                        ;
                                        ;ROUTINE TO PRINT TEST HEADER
                                        ;
                                        ;**********

003236  012700  000000      $PRHDR: MOV     #0,R0           ;TRANSMIT
003242  104015                      PRINTC                  ;NUL CODE.
003244  104007                      TYPEM                   ;PRINT MESSAGE
003246  014113                      HDRMSG
003250  016700  175362              MOV     RTNNO,R0        ;GET TEST NUMBER
003254  006200                      ASR     R0              ;GET FIRST DIGIT
003256  006200                      ASR     R0
003260  006200                      ASR     R0
003262  042700  177770              BIC     #177770,R0      ;MASK FIRST DIGIT
003266  062700  000060              ADD     #60,R0          ;MAKE ASCII
003272  104015                      PRINTC                  ;PRINT DIGIT
003274  016700  175336              MOV     RTNNO,R0        ;GET TEST NUMBER AGAIN
003300  042700  177770              BIC     #177770,R0      ;MASK LAST DIGIT
003304  062700  000060              ADD     #60,R0          ;MAKE ASCII
003310  104015                      PRINTC                  ;PRINT DIGIT
003312  104012                      CRLF                    ;CR-LF
003314  104014                      LF                      ;BLANK LINE
003316  000002                      RTI                     ;RETURN
```

```
                                        ;**********
                                        ;
                                        ;ERRA-- COMMON ERROR RETURN FROM I/O TESTS. HALTS
                                        ;       WITH ADDRESS OF ERROR IN R0. TO CONTINUE
                                        ;       ON SAME TEST BUT NOT HALTING ON ERROR,
                                        ;       SET THE SCOPE BIT (14) = 1 AND PRESS CONTINUE
                                        ;
                                        ;**********

003320  032777  040000  175366  ERR:    BIT     #SCOPSW,@SR     ;CHECK SCOPE SWITCH
003326  001404                          BEQ     1$              ;BRANCH IF NO SCOPE
003330  005767  175310                  TST     PRGID           ;SCOPING WANTED, FIRST ERROR?
003334  100001                          BPL     1$              ;BRANCH AND HALT ON FIRST ERROR
003336  000002                          RTI                     ;SCOPE EXIT
003340  052767  100000  175276  1$:     BIS     #BIT15,PRGID    ;SET ERROR INDICATOR
003346  011600                  EHLT:   MOV     @SP,R0
003350  005740                          TST     -(R0)           ;ADDRESS OF CALL INTO R0
003352  000000                          HALT
003354  000002                  ERRHLT: RTI                     ;RETURN TO TEST FOLLOWING CALL

                                        ;**********
                                        ;
                                        ;STLSRV--- THIS ROUTINE SETS UP KEYBOARD INTERRUPT
                                        ;         VECTOR AND PRIOITY. CALLING SEQUENCE
                                        ;
                                        ;       STRDRV
                                        ;       AT20C   ;LOCATION OF NEW INTERRUPT VECTOR
                                        ;
                                        ;**********

003356  017667  000000  000012  STLSRV: MOV     @(SP),STPRA+2   ;SET RETURN ADR AND VECTOR
003364  062716  000002                  ADD     #2,@SP
003370  016701  175226                  MOV     TKVTR,R1
003374  012721  000000          STPRA:  MOV     #0,(R1)+
003400  016721  175220                  MOV     TKLVL,(R1)+
003404  000002                          RTI

                                        ;**********
                                        ;
                                        ;STLSPV-- THIS ROUTINE SETS UP PRINTER INTERRUPT
                                        ;
                                        ;       VECTOR AND PRIORITY CALLING SEQUENCE
                                        ;       STPCHV
                                        ;       AT35E   ;LOCATION OF NEW INTERRUPT VECTOR
                                        ;
                                        ;**********

003406  017667  000000  000012  STLSPV: MOV     @(SP),STPPA+2   ;SET RETURN ADR AND VECTOR
003414  062716  000002                  ADD     #2,@SP
003420  016701  175202                  MOV     TPVTR,R1
003424  012721  000000          STPPA:  MOV     #0,(R1)+
003430  016721  175174                  MOV     TPLVL,(R1)+
003434  000002                          RTI                     ;RETURN TO CALLER
```

```
                        ;**********
                        ;
                        ;DELAY--A COMMON ROUTINE TO DELAY PROCESSING
                        ;       A GIVEN NUMBER OF MSEC.
                        ;       CALLING SEQUENCE;
                        ;       MOV   #5,R0   ;R0 CONTAINS THE NUMBER OF MSEC DELAY DESIRED
                        ;       DELAY
                        ;
                        ;       THE DELAY IS EFFECTED BY THE EXECUTION OF THE LOOP;
                        ;          1$:  DEC  R1
                        ;               BNE  1$
                        ;
                        ;       SINCE THE EXECUTION TIMES OF THE PDP11 LINE DOES VARY FROM
                        ;       MACHINE TO MACHINE, THE VALUE AT SYMBOLIC LOCATION
                        ;       "TIMER" MUST BE CHANGED TO THE APPROPRIATE VALUE AS SHOWN BELOW
                        ;       BEFORE STARTING THE DIAGNOSTIC. "TIMER" IS INITIALIZED
                        ;       FOR AN 11/05,11/10(=251).
                        ;
                        ;MACHINE        05&10   35&40   15&20   LSI&03          11/45 & 11/70
                        ;                                                BIPOLAR        MOS       CORE
                        ;
                        ;LOOP: DEC R1   3.4     .99     2.3                .30             .51     .90
                        ;      BNE LOOP 2.5     1.76    2.6                .60             .98    1.13
                        ;  TIME=         5.9USEC 2.75    4.9     7.7     .90USEC         1.49USEC        2.03USEC
                        ; SET TIMER     251     554     314     202     2127            1237    755
                        ;
                        ;XXXXXXXXXX
                        ;
64000 003436  010146    DLY:    MOV     R1,-(SP)        ;SAVE R1
64100 003440  016701  175226  1$:     MOV     TIMER,R1        ;MOV 1 MSEC LOOP CNT TO R1
64200 003444  005301          2$:     DEC     R1              ;DECREMENT COUNT
64300 003446  001376                  BNE     2$              ;BRANCH IF NOT ZERO
64400 003450  005300                  DEC     R0              ;DEC NO. OF MSEC DELAY
64500 003452  001372                  BNE     1$              ;DELAY AGAIN IF NOT ZERO
64600 003454  012601                  MOV     (SP)+,R1        ;ALL DONE RESTORE R1
64700 003456  000002                  RTI
```

```
64900                   ;**********
65000                   ;
65100                   ;PFAIL--POWER FAIL ROUTINE
65200                   ;       SAVE ALL REGISTERS AND SET RESTART ADDRESS
65300                   ;       INTO LOCATION 24
65400                   ;
65500                   ;RESTART--POWER FAIL RECOVERY
```

```
100                             ;       RESTORE ALL REGISTERS AND GO TO START
```

```
                                        ;
                                        ;**********

003460  010046                  PFAIL:  MOV     R0,-(SP)
003462  010146                          MOV     R1,-(SP)
003464  010246                          MOV     R2,-(SP)
003466  010346                          MOV     R3,-(SP)
003470  010446                          MOV     R4,-(SP)
003472  010546                          MOV     R5,-(SP)
003474  016746  174324                  MOV     24,-(SP)
003500  010667  000010                  MOV     SP,SAVR6        ;SAVE STACK POSITION
003504  012767  003516  174312          MOV     #RESTRT,24      ;STORE RESTART ADDRESS
003512  000000                          HALT
003514  000000                  SAVR6:  .WORD   0
003516  104007                  RESTRT: TYPEM
003520  003552                          1$
003522  016706  177766                  MOV     SAVR6,SP        ;RESTORE STACK POINTER
003526  012667  174272                  MOV     (SP)+,24        ;RESTORE PFAIL ADDRESS
003532  012605                          MOV     (SP)+,R5
003534  012604                          MOV     (SP)+,R4
003536  012603                          MOV     (SP)+,R3
003540  012602                          MOV     (SP)+,R2
003542  012601                          MOV     (SP)+,R1
003544  012600                          MOV     (SP)+,R0
003546  000167  175236                  JMP     START

003552      200     120     117  1$:    .ASCIZ  <ACRLF>/POWER/<ACRLF>
003555      127     105     122
003560      200     000
                                        .EVEN
```

```
                                        ;**********
                                        ;
                                        ;FORWARD--THIS ROUTINE TRANSFERS THE 2 OR 4 ARGUMENTS
                                        ;         FROM THE TEST ROUTINE. THEY ARE;
                                        ;
                                        ;         1- ROUTINE NUMBER
                                        ;         2- ADDRESS OF NEXT TEST
                                        ;         3- ITERATION COUNT (I/O TESTS ONLY)
                                        ;         4- SCOPE ENTRY ADDRESS (I/O TESTS ONLY)
                                        ;
                                        ;**********

003562  016705  175052          $FORWD: MOV     NXTST,R5        ;ADDR OF NEXT TEST TO R5
003566  012567  175044                  MOV     (R5)+,RTNNO     ;GET NUMBER OF NEXT TEST
003572  012567  175042                  MOV     (R5)+,NXTST     ;GET ADDR OF FOLLOWING TEST
003576  105767  175042                  TSTB    PRGID           ;CHECK IF I/O TEST
003602  100407                          BMI     FORWDB          ;SKIP THE FETCH OF ITER CNT AND SCOPE
003604  012567  175050                  MOV     (R5)+,ICTR      ;GET ITERATION COUNT
003610  012567  175026                  MOV     (R5)+,SCOPTR    ;GET SCOPE ENTRY POINT
003614  010567  175056          FORWDA: MOV     R5,CURTST       ;ENTRY POINT TO TEST IN CUR TST
003620  000002                          RTI                     ;EXIT
003622  012767  177777  175012  FORWDB: MOV     #-1,SCOPTR      ;FORCE NO SCOPE
003630  012767  000001  175022          MOV     #1,ICTR         ;FORCE INTERATION COUNT OF 1
003636  000766                          BR      FORWDA
```

```
                                ;**********
                                ;
                                ;AREAD--A ROUTINE WHICH, THROUGH THE FACILITY OF
                                ;       THE MAINTENANCE BIT, OUTPUTS TO THE
                                ;       PRINTER BUFFER AND READS THE KEYBOARD
                                ;       STATUS DONE. IF THE DONE IS NOT SET
                                ;       WITHIN 600 MSEC, THE CPU WILL HALT WITH
                                ;       THE LOCATION OF THE ERROR IN R0. PRESS
                                ;       CONTINUE TO CONTINUE WITH TESTS.
                                ;
                                ;**********

003640  012767  000600  175016 $AREAD: MOV     #600,BRCTR      ;SET UP 600 MSEC DELAY
003646  052777  000004  174742         BIS     #4,@TPS         ;SET MAINTENANCE BIT
003654  005077  174740                 CLR     @TPB            ;LOAD PRINTER BUFFER
003660  105777  174726         1$:     TSTB    @TKS            ;CHECK DONE BIT
003664  100410                 BMI     2$                      ;BRANCH IF DONE
003666  012700  000001         MOV     #1,R0                   ;ONE TO R0
003672  104010                 DELAY                           ;DELAY 1 MSEC.
003674  005367  174764         DEC     BRCTR                   ;600 MSEC OVER
003700  001367                 BNE     1$                      ;BRANCH IF NO
003702  104002                 EHALT
003704  000755                 BR      $AREAD                  ;TRY AGAIN
003706  000002         2$:     RTI                             ;RETURN TO TEST

                                ;**********
                                ;
                                ;CONIT--THIS ROUTINE SETS UP THE DEVICE ADDRESSES
                                ;       AND INTERRUPT VECTORS FOR THE CONSOLE
                                ;       TERMINAL.
                                ;
                                ;**********

003710  016700  174666         CONIT:  MOV     CONADD,R0       ;CONSOLE KEYBOARD STATUS ADDR TO R0
003714  010067  174672         CONSET: MOV     R0,TKS          ;KEYBOARD STATUS ADDRESS (777560) TO TKS
003720  005720                 TST     (R0)+                   ;INCREMENT R0 BY TWO
003722  010067  174666         MOV     R0,TKB                  ;KEYBOARD DATA ADDR (777562) TO TKB
003726  005720                 TST     (R0)+                   ;INCREMENT R0 BY TWO
003730  016767  174662  000044 MOV     TPS,TPSS                ;SAVE TPS OF LAST TERMINAL
003736  010067  174654         MOV     R0,TPS                  ;PRINTER STATUS ADDR(777564) TO TPS
003742  005720                 TST     (R0)+                   ;INCREMENT R0 BY TWO
003744  016767  174650  000032 MOV     TPB,TPBS                ;SAVE TPB OF LAST TERMINAL
003752  010067  174642         MOV     R0,TPB                  ;PRINTER DATA ADDR (777566) TO TPB
003756  016767  174622  174636 MOV     CONVEC,TKVTR            ;KEYBOARD INTERRUPT VECTOR (60) TO TKVTR
003764  016767  174614  174634 MOV     CONVEC,TPVTR
003772  062767  000004  174626 ADD     #4,TPVTR                ;PRINTER INTERRUPT VECTOR (64) TO TPVTR
004000  000207                 RTS     PC

004002  000000         TPSS:   .WORD   0                       ;LAST TERM STATUS REG ADR
004004  000000         TPBS:   .WORD   0                       ;LAST TERM BUFFER REG ADR
```

```
                                        ;**********
                                        ;
                                        ;BINARY TO ASCII CONVERSION (1 TO 5 ASCII CHARACTERS)
                                        ;CALLING SEQUENCE
                                        ;       MOV     ADDRESS OF LOC. TO STORE FIRST ASCII CHAR. INTO R0
                                        ;       MOV     BINARY NUMBER TO BE CONVERTED INTO R1
                                        ;       MOV     NUMBER TO BE CONVERTED AS A POWER OF TEN INTO R2
                                        ;       BTOASC
                                        ;
                                        ;**********

004006  010267  000060          $BTASC: MOV     R2,CNVCTR       ;SAVE TEN POWER
004012  006302                          ASL     R2              ;R2*2
004014  062702  004100                  ADD     #ADTENP,R2      ;CALCULATE ADDRESS OF
                                                                ;STARTING TEN POWER
004020  014267  000052          1$:     MOV     -(R2),TENPWR    ;POWER OF TEN VALUE TO TEN PWR
004024  005067  000044                  CLR     DIGIT           ;CLEAR CURRENT DIGIT
004030  166701  000042          2$:     SUB     TENPWR,R1       ;SUBTRACT TEN POWER FROM BINARY VALUE
004034  103403                          BCS     3$              ;BRANCH IF END
004036  005267  000032                  INC     DIGIT
004042  000772                          BR      2$
004044  066701  000026          3$:     ADD     TENPWR,R1       ;RESTORE SUBTRACTED VALUE
004050  062767  000060  000016          ADD     #60,DIGIT       ;CONVERT (DIGIT) TO ASCII
004056  116720  000012                  MOVB    DIGIT,(R0)+     ;PUT ASCII CHAR INTO USER BUFFER
004062  005367  000004                  DEC     CNVCTR          ;FINISHED ALL CHARS. CALLED FOR
004066  001354                          BNE     1$              ;BRANCH IF NOT FINISHED
004070  000002                          RTI                     ;YES, EXIT
004072  000000          CNVCTR: .WORD   0               ;CONVERSION CHARACTER COUNT
004074  000000          DIGIT:  .WORD   0               ;CONVERTED CHARACTER
004076  000000          TENPWR: .WORD   0               ;CURRENT TEN POWER
004100  000001  000012  000144  ADTENP: .WORD   1.,10.,100.,1000.,10000.
004106  001750  023420
```

```
13800                                   ;XXXXXXXXXX
13900                                   ;
14000                                   ;READ-- A COMMON ROUTINE WHICH CHECKS THE KEYBOARD
14100                                   ;       DONE FLAG & SETS A FLAG INDICATING CHAR PARITY
14200                                   ;
14300                                   ;XXXXXXXXXX
14400
14500 004112  004767  177572           $READ:  JSR     PC,CONIT        ;RESET CONSOLE ADR AND VECTORS
14600 004116  005767  174534                   TST     DLCNT           ;CHECK IF MULTI DL11'S AVAILABLE
14700 004122  001430                           BEQ     $READC          ;NONE, WAIT FOR CONSOLE INPUT
14800 004124  016767  174526  174534   1$:     MOV     DLCNT,COUNT3    ;SET DL11 COUNT
14900 004132  016767  174474  174530           MOV     FSTDL,XCSR      ;ADDRESS OF FIRST DL11 INTO XCSR
15000 004140  105777  174524           2$:     TSTB    @XCSR           ;TEST IF ANY INPUT
15100 004144  100005                           BPL     3$              ;CONTINUE IF NO INPUT
15200 004146  016700  174516                   MOV     XCSR,R0         ;SET THIS DL11 AS CONSOLE
15300 004152  004767  177536                   JSR     PC,CONSET
15400 004156  000415                           BR      READ1           ;READ CHAR AND RETURN
15500 004160  005367  174502           3$:     DEC     COUNT3          ;DECREMENT DL11 COUNT
15600 004164  001404                           BEQ     4$              ;TEST CONSOLE WHEN DONE DL11'S
15700 004166  062767  000010  174474           ADD     #10,XCSR        ;NEXT DL11 ADDRESS
15800 004174  000761                           BR      2$              ;CONTINUE
15900 004176  105777  174410           4$:     TSTB    @TKS            ;CHECK CONSOLE
16000 004202  100350                           BPL     1$              ;WAIT, NO INPUT
16100 004204  105777  174402           $READC: TSTB    @TKS            ;CHECK KEYBOARD DONE FLAG
16200 004210  100375                           BPL     $READC          ;BRANCH IF NOT SET
16300 004212  117767  174376  174460   READ1:  MOVB    @TKB,TEMPCH     ;SAVE CHARACTER
16400 004220  116767  174454  174456           MOVB    TEMPCH,PCHAR    ;SAVE CODE WITH PARITY BIT
16500 004226  042767  177400  174450           BIC     #177400,PCHAR   ;MASK UNWANTED BITS
16600 004234  116767  174440  174441           MOVB    TEMPCH,PARITY+1 ;SAVE CHAR WITH PARITY BIT
16700 004242  042767  177600  174430           BIC     #177600,TEMPCH  ;MAKE IT 7 BIT ASCII
16800 004250  026727  174424  000004           CMP     TEMPCH,#4       ;DISREGARD EOT
16900 004256  001715                           BEQ     $READ
17000 004260  012700  000011                   MOV     #11,R0          ;SET SHIFT COUNT
17100 004264  042767  000377  174410           BIC     #377,PARITY     ;CLEAR PARITY FLAG
17200 004272  005300                   1$:     DEC     R0              ;DECREMENT SHIFT COUNT
17300 004274  001406                           BEQ     2$              ;EXIT IF DONE
17400 004276  106367  174401                   ASLB    PARITY+1        ;SHIFT CODE
17500 004302  103373                           BCC     1$              ;CONTINUE IF BIT WAS ZERO
17600 004304  105167  174372                   COMB    PARITY          ;CHANGE PARITY FLAG IF BIT WAS ONE
17700 004310  000770                           BR      1$              ;CONTINUE
17800 004312  000002                   2$:     RTI                     ;SET, RET. TO CALLER
17900
18000                                   ;XXXXXXXXXX
18100                                   ;
18200                                   ;PRINT-- A COMMON ROUTINE TO CHECK THE PRINTER READY FLAG
18300                                   ;
18400                                   ;XXXXXXXXXX
18500
18600 004314  105777  174276           $PRNT:  TSTB    @TPS            ;CHECK PRINTER READY FLAG
18700 004320  100375                           BPL     $PRNT           ;BRANCH IF NOT SET
18800 004322  000002                           RTI                     ;SET, RETURN
```

```
                                        ;**********
                                        ;
                                        ;PRINTC--SENDS A CHARACTER AT A TIME FIRST TO THE
                                        ;       CONSOLE  DL11 THEN TO ALL MULTIPLE DL11S IF
                                        ;       SR BIT 13 IS = 0. IF THE REFERENCED PRINTER
                                        ;       READY BIT IS NOT SET, THE CHARACTER WILL NOT BE
                                        ;       SENT TO THAT PRINTER. ENTER WITH CHARACTER IN R0.
                                        ;       CALL:   PRINTC
                                        ;
                                        ;********
004324  016767  174252  174360 $PRTC:   MOV     CONADD,TEMP     ;SET CONSOLE ADR
004332  062767  000004  174352          ADD     #4,TEMP
004340  105777  174346         1$:     TSTB    @TEMP
004344  100375                         BPL     1$              ;WAIT FOR CONSOLE READY
004346  062767  000002  174336         ADD     #2,TEMP         ;SET ADR
004354  010077  174332                 MOV     R0,@TEMP        ;LOAD CONSOLE PRINTER BUFFER
004360  032777  020000  174326         BIT     #BIT13,@SR      ;CHECK SW 13
004366  001003                         BNE     2$              ;SEND ALL TERMS IF SW13 DOWN
004370  005767  174262                 TST     DLCNT           ;CHECK IF MULTIPLE DL11'S
004374  001002                         BNE     3$              ;CHECK FOR INPUT IF THERE
004376  000167  000432         2$:     JMP     18$
004402  016767  174250  174256 3$:     MOV     DLCNT,COUNT3    ;PUT NO. DL11'S INTO COUNT3
004410  016767  174216  174252         MOV     FSTDL,XCSR      ;ADDR OF FIRST DL INTO XCSR
004416  005767  174266         4$:     TST     INCHK           ;CHECK FOR INPUT?
004422  001140                         BNE     13$
004424  026727  174206  000020         CMP     RTNNO,#20       ;PRINTING TEST?
004432  002004                         BGE     5$              ;BRANCH IF NOT
004434  022767  104011  175236         CMP     #TTYCTL,WAITF   ;KEYBOARD CONTROL?
004442  001130                         BNE     13$             ;SKIP INPUT CHECK IF NOT
004444  105777  174220         5$:     TSTB    @XCSR           ;TEST IF ANY INPUT
004450  100125                         BPL     13$             ;CONTINUE IF NO INPUT
004452  062767  000002  174210         ADD     #2,XCSR         ;SET BUFFER ADDRESS
004460  017767  174204  174212         MOV     @XCSR,TEMPCH
004466  042767  177600  174204         BIC     #177600,TEMPCH
004474  026727  174200  000003         CMP     TEMPCH,#3       ;CHECK IF CONTROL-C
004502  001006                         BNE     6$              ;CONTINUE IF NOT
004504  026727  174126  000024         CMP     RTNNO,#24       ;CHECK IF TEST 24
004512  001002                         BNE     6$              ;CONTINUE IF NOT CONTROL-C
004514  000167  000420                 JMP     20$
004520  026727  174154  000177 6$:     CMP     TEMPCH,#177     ;CHECK IF RUBOUT
004526  001427                         BEQ     9$              ;YES, CHECK TEST NUMBER
004530  026727  174102  000017         CMP     RTNNO,#17       ;TEST 17?
004536  001003                         BNE     7$              ;BRANCH IF NOT
004540  016703  174134                 MOV     TEMPCH,R3       ;SAVE CHARACTER
004544  000461                         BR      12$             ;CONTINUE
004546  026727  174064  000021 7$:     CMP     RTNNO,#21       ;TEST 21?
004554  001004                         BNE     8$              ;BRANCH IF NOT
004556  016767  174116  174076         MOV     TEMPCH,REPT     ;SAVE CHARACTER
004564  000451                         BR      12$             ;CONTINUE
004566  026727  174044  000022 8$:     CMP     RTNNO,#22       ;TEST 22?
004574  001056                         BNE     14$             ;CONTINUE IF NOT
004576  016767  174076  174056         MOV     TEMPCH,REPT     ;SAVE CHARACTER
004604  000441                         BR      12$             ;CONTINUE
004606  026727  174024  000021 9$:     CMP     RTNNO,#21       ;CHECK IF TEST 21
004614  001011                         BNE     10$             ;NO, CHECK IF TEST 22
004616  022626                         POPSP2                  ;ASJUST STACK
```

```
24700 004620 012700 000036          MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
24800 004624 104010                 DELAY
24900 004626 104007                 TYPEM                   ;YES, TEST 21
25000 004630 014272                 ECOEND                  ;PRINT TERMINATION MESSAGE
25100 004632 104005                 CHAIN                   ;CHAIN TO NEXT TEST
25200 004634 000167 005334          JMP     E021A           ;REPEAT TEST IF LOOP ON TEST SW SET
25300 004640 026727 173772 000022 10$:  CMP     RTNNO,#22       ;CHECK IF TEST 22
25400 004646 001011                 BNE     11$             ;NO, CHECK IF TEST 24
25500 004650 022626                 POPSP2                  ;ADJUST STACK
25600 004652 012700 000036          MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
25700 004656 104010                 DELAY
25800 004660 104007                 TYPEM                   ;YES, PRINT TERMINATION MESSAGE
25900 004662 014272                 ECOEND
26000 004664 104005                 CHAIN                   ;CHAIN TO NEXT TEST
26100 004666 000167 005340          JMP     E022A           ;REPEAT TEST IF LOOP ON TEST SW SET
26200 004672 026727 173740 000024 11$:  CMP     RTNNO,#24       ;TEST 24?
26300 004700 001133                 BNE     22$             ;WAIT FOR NEXT TEST IF NOT TEST 24
26400 004702 022626                 POPSP2                  ;RESET STACK
26500 004704 000167 006244          JMP     TERM            ;TERMINATE TEST
26600 004710 012700 000036       12$:  MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
26700 004714 104010                 DELAY
26800 004716 016700 173756          MOV     TEMPCH,R0       ;SET NEW CHARACTER
26900 004722 000403                 BR      14$             ;CONTINUE
27000 004724 062767 000002 173736 13$:  ADD     #2,XCSR         ;SET STATUS ADDRESS IN XCSR
27100 004732 062767 000002 173730 14$:  ADD     #2,XCSR
27200 004740 016767 173636 173744   MOV     CONADD,TEMP     ;CHECK IF CONSOLE TERMINAL
27300 004746 062767 000004 173736   ADD     #4,TEMP         ;IS THIS DL
27400 004754 026767 173732 173706   CMP     TEMP,XCSR
27500 004762 001420                 BEQ     17$
27600 004764 105777 173700       15$:  TSTB    @XCSR           ;TEST PRINTER READY
27700 004770 100375                 BPL     15$             ;WAIT FOR READY
27800 004772 062767 000002 173670   ADD     #2,XCSR         ;SET XCSR TO PRINTER BUFFER
27900 005000 010077 173664          MOV     R0,@XCSR        ;LOAD CHARACTER INTO BUFFER
28000 005004 005367 173656       16$:  DEC     COUNT3          ;DECREASE COUNT OF DL11'S
28100 005010 001411                 BEQ     18$             ;ALL DONE,EXIT
28200 005012 062767 000002 173650   ADD     #2,XCSR         ;SET XCSR TO NEXT DL11 PRINTER STATUS
28300 005020 000167 177372          JMP     4$              ;GO TEST NEXT DL11 READY FLAG
28400 005024 062767 000002 173636 17$:  ADD     #2,XCSR         ;SET XCSR TO PRINTER BUFFER
28500 005032 000764                 BR      16$             ;DO NOT LOAD BUFFER
28600 005034 005767 173650       18$:  TST     INCHK           ;WANT INPUT CHECK?
28700 005040 001111                 BNE     26$             ;NO, BRANCH
28800 005042 026727 173570 000020   CMP     RTNNO,#20       ;PRINTING TEST?
28900 005050 002004                 BGE     19$             ;BRANCH IF NOT
29000 005052 022767 104011 174620   CMP     #TTYCTL,WAITF   ;KEYBOARD CONTROL?
29100 005060 001101                 BNE     26$             ;SKIP INPUT CHECK IF NOT
29200 005062 105777 173514       19$:  TSTB    @CONADD         ;TEST IF ANY INPUT
29300 005066 100076                 BPL     26$             ;BRANCH IF NONE
29400 005070 016767 173506 173614   MOV     CONADD,TEMP     ;SET ADR
29500 005076 062767 000002 173606   ADD     #2,TEMP
29600 005104 117767 173602 173566   MOVB    @TEMP,TEMPCH
29700 005112 042767 177600 173560   BIC     #177600,TEMPCH  ;MASK UNWANTED BITS
29800 005120 026727 173554 000003   CMP     TEMPCH,#3       ;CHARACTER = CONTROL-C?
29900 005126 001013                 BNE     21$             ;CONTINUE IF NOT
30000 005130 026727 173502 000024   CMP     RTNNO,#24       ;TEST 24?
30100 005136 001007                 BNE     21$             ;CONTINUE IF NOT
30200 005140 012700 000036       20$:  MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
30300 005144 104010                 DELAY
```

```
 30400 005146  104012                          CRLF                    ;SEND CR-LF
 30500 005150  022626                          POPSP2                  ;RESET STACK
 30600 005152  000167  005650                  JMP     E024B           ;RETURN TO TEST
 30700 005156  026727  173516  000177  21$:    CMP     TEMPCH,#177     ;CHECK IF RUBOUT
 30800 005164  001006                          BNE     23$             ;BRANCH IF NO
 30900 005166  000607                          BR      9$
 31000 005170  012767  000001  173436  22$:    MOV     #1,CNTLSW       ;CLEAR LOOP AND SEQUENCE BITS
 31100 005176  000167  174660                  JMP     TTY1B           ;GO WAIT FOR NEXT TEST
 31200 005202  010046                  23$:    MOV     R0,-(SP)        ;SAVE R0
 31300 005204  012700  000036                  MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
 31400 005210  104010                          DELAY
 31500 005212  012600                          MOV     (SP)+,R0        ;RESTORE R0
 31600 005214  026727  173416  000017          CMP     RTNNO,#17       ;CHECK IF TEST 17
 31700 005222  001002                          BNE     24$             ;BRANCH IF NOT TEST 17
 31800 005224  016703  173450                  MOV     TEMPCH,R3       ;STORE INPUTTED CHARACTER
 31900 005230  026727  173402  000021  24$:    CMP     RTNNO,#21       ;CHECK IF TEST 21
 32000 005236  001003                          BNE     25$             ;BRANCH IF NOT TEST 21
 32100 005240  016767  173434  173414          MOV     TEMPCH,REPT     ;STORE INPUTTED CHARACTER
 32200 005246  026727  173364  000022  25$:    CMP     RTNNO,#22       ;CHECK IF TEST 22
 32300 005254  001003                          BNE     26$             ;BRANCH IF NOT TEST 22
 32400 005256  016767  173416  173376          MOV     TEMPCH,REPT     ;STORE INPUTTED CHARACTER
 32500 005264  000002                  26$:    RTI                     ;RETURN TO TEST
 32600
```

```
32800
```

```
                                .SBTTL  I/O LOGIC TESTS
                              ;
                              ;**********
                              ;
                              ;ONLY THE CONSOLE TERMINAL IS TESTED.
                              ;UPON COMPLETION, THE CPU WILL EITHER HALT IF SR
                              ;BIT8 IS = 1 AND AWAIT FUTHER INSTRUCTIONS OR CONTINUE
                              ;AND EXECUTE THE PRINTER TESTS CONTINOUSLY
                              ;IF AN I/O TEST FAILS, THE CPU WILL HALT AT ERRHLT
                              ;WITH THE ADDRESS OF THE ERROR IN R0 (LOC 777700). PRESSING
                              ;THE CONTINUE SWITCH WILL CAUSE THE I/O TEST TO
                              ;CONTINUE WITH THE NEXT TEST. HOWEVER IF SWITCH 14
                              ;WERE SET, OR IS SET BEFORE THE CONTINUE SWITCH IS
                              ;PRESSED, THE FAILED TEST WILL LOOP ON ITSELF
                              ;WITHOUT FURTHER HALTS
                              ;
                              ;**********
                              ;AT0--  TEST #40--TESTS THE ABILITY TO REFERENCE THE
                              ;       RECEIVER STATUS WORD (TKS) WITHOUT TRAPPING.
                              ;**********

005266  000040                AT0:    40                      ;TEST NUMBER
005270  005320                AT0X:   AT1                     ;NEXT TEST
005272  000012                        10.                     ;ITERATION COUNT
005274  005304                        1$                      ;SCOPE ENTRY
005276  012767  005314  172500        MOV     #3$,MACHER      ;SET UP MACHINE ERROR TRAP
005304  005777  173302        1$:     TST     @TKS            ;REFERENCE RECEIVER STATUS WORD
005310  104005                2$:     CHAIN                   ;CHAIN TO NEXT TEST
005312  000774                        BR      1$              ;REPEAT TEST
005314  104001                3$:     ERROR                   ;ERROR TRAPPED WHEN REFERENCING
005316  000774                        BR      2$              ;RECEIVER STATUS WORD (TKS)

                              ;**********
                              ;AT1--TEST #41--TESTS THE ABILITY TO  REFERENCE THE
                              ;       RECEIVER BUFFER (TKB) WITHOUT TRAPPING.
                              ;**********

005320  000041                AT1:    41                      ;TEST NUMBER
005322  005352                        AT2                     ;NEXT TEST
005324  000012                        10.                     ;ITERATION COUNT
005326  005336                        1$                      ;SCOPE ENTRY
005330  012767  005346  172446        MOV     #3$,MACHER      ;SET UP MACHINE ERROR TRAP
005336  005777  173252        1$:     TST     @TKB            ;REFERENCE RECEIVER BUFFER
005342  104005                2$:     CHAIN                   ;CHAIN TO NEXT TEST
005344  000774                        BR      1$              ;REPEAT TEST
005346  104001                3$:     ERROR                   ;TRAPPED WHEN REFERENCING
005350  000774                        BR      2$              ;RECEIVER BUFFER (TKB)
```

```
                                        ;**********
                                        ;AT2--TEST #42--TESTS THE ABILITY TO REFERENCE THE
                                        ;       TRANSMITTER STATUS WORD (TPS) WITHOUT TRAPPING.
                                        ;**********

005352  000042                  AT2:    42                      ;TEST NUMBER
005354  005404                          AT3                     ;NEXT TEST
005356  000012                          10.                     ;ITERATION COUNT
005360  005370                          1$                      ;SCOPE ENTRY
005362  012767  005400  172414          MOV     #3$,MACHER      ;SET UP MACHINE ERROR TRAP
005370  005777  173222          1$:     TST     @TPS            ;REFERENCE TRANSMITTER STATUS
005374  104005                  2$:     CHAIN                   ;CHAIN TO NEXT TEST
005376  000774                          BR      1$              ;REPEAT TEST
005400  104001                  3$:     ERROR                   ;TRAPPED WHEN REFERENCING
005402  000774                          BR      2$              ;TRANSMITTER STATUS WORD

                                        ;**********
                                        ;AT3--  TEST #43--TESTS THE ABILITY TO REFERENCE THE
                                        ;       TRANSMITTER BUFFER (TPB) WITHOUT TRAPPING.
                                        ;**********

005404  000043                  AT3:    43                      ;TEST NUMBER
005406  005436                          AT4                     ;NEXT TEST
005410  000012                          10.                     ;ITERATION COUNT
005412  005422                          1$                      ;SCOPE ENTRY
005414  012767  005432  172362          MOV     #3$,MACHER      ;SET UP ERROR TRAP
005422  005777  173172          1$:     TST     @TPB            ;REFERENCE TRANSMITTER BUFFER
005426  104005                  2$:     CHAIN                   ;CHAIN TO NEXT TEST
005430  000774                          BR      1$              ;REPEAT TEST
005432  104001                  3$:     ERROR                   ;TRAPPED WHEN REFERENCING
005434  000774                          BR      2$              ;TRANSMITTER BUFFER.
```

```
                                ;**********
                                ;AT4--  TEST #44--TESTS THE ABILITY TO SET AND CLEAR THE
                                ;       RECEIVER INTERRUPT ENABLE BIT.
                                ;**********

005436  000044                  AT4:    44                      ;TEST NUMBER
005440  005526                          AT5                     ;NEXT TEST
005442  000012                          10.                     ;ITERATION COUNT
005444  005460                          1$                      ;SCOPE ENTRY
005446  012746  000340                  MOV     #PRTY7,-(SP)    ;SET PRIORITY 7
005452  012746  005460                  MOV     #1$,-(SP)
005456  000002                          RTI
005460  052777  000100  173124  1$:     BIS     #BIT6,@TKS      ;SET INTERRUPT ENABLE BIT
005466  032777  000100  173116          BIT     #BIT6,@TKS      ;CHECK IF BIT IS SET
005474  001002                          BNE     3$              ;BRANCH IF SET
005476  104001                  2$:     ERROR                   ;NOT SET, ERROR
005500  000410                          BR      5$              ;CHAIN TO NEXT TEST
005502  042777  000100  173102  3$:     BIC     #BIT6,@TKS      ;CLEAR INTERRUPT ENABLE BIT
005510  032777  000100  173074          BIT     #BIT6,@TKS      ;CHECK IF BIT IS CLEARED
005516  001401                          BEQ     5$              ;BRANCH IF CLEARED
005520  104001                  4$:     ERROR                   ;NOT CLEARED, ERROR
005522  104005                  5$:     CHAIN                   ;CHAIN TO NEXT TEST
005524  000755                          BR      1$              ;DO TEST AGAIN

                                ;**********
                                ;AT5--  TEST #45--CHECKS THAT THE RECEIVER INTERRUPT
                                ;       ENABLE BIT CAN BE CLEARED WITH RESET INSTRUCTION.
                                ;**********
                                ;
005526  000045                  AT5:    45                      ;TEST NUMBER
005530  005604                          AT6                     ;NEXT TEST
005532  000012                          10.                     ;ITERATION COUNT
005534  005550                          1$                      ;SCOPE ENTRY
005536  012746  000340                  MOV     #PRTY7,-(SP)    ;SET PRIORITY TO 7
005542  012746  005550                  MOV     #1$,-(SP)
005546  000002                          RTI
005550  052777  000100  173034  1$:     BIS     #BIT6,@TKS      ;SET INTERRUPT ENABLE BIT
005556  105777  173034          3$:     TSTB    @TPS            ;BE SURE PRINTER IS DONE WITH DL11S1 MESSAGE
005562  001775                          BEQ     3$              ;BEFORE ALLOWING FOLLOWING RESET.
005564  000005                          RESET                   ;RESET
005566  032777  000100  173016          BIT     #BIT6,@TKS      ;TEST INTERRUPT ENABLE BIT
005574  001401                          BEQ     2$              ;BRANCH IF CLEARED
005576  104001                          ERROR                   ;STILL SET,ERROR
005600  104005                  2$:     CHAIN                   ;CHAIN TO NEXT ROUTINE
005602  000762                          BR      1$              ;REPEAT TEST
```

```
12700                                   ;**********
12800                                   ;AT6--  TEST#46--TESTS THE ABILITY TO SET AND CLEAR
12900                                   ;       TRANSMITTER INTERRUPT ENABLE BIT.
13000                                   ;**********
13100
13200 005604  000046                    AT6:    46                      ;TEST NUMBER
13300 005606  005674                            AT7                     ;NEXT TEST
13400 005610  000012                            10.                     ;ITERATION COUNT
13500 005612  005626                            1$                      ;SCOPE ENTRY
13600 005614  012746  000340                      MOV     #PRTY7,-(SP)  ;SET PRIORITY TO 7
13700 005620  012746  005626                      MOV     #1$,-(SP)
13800 005624  000002                            RTI
13900 005626  052777  000100  172762    1$:     BIS     #BIT6,@TPS      ;SET INTERRUPT ENABLE BIT
14000 005634  032777  000100  172754            BIT     #BIT6,@TPS      ;CHECK THAT BIT IS SET
14100 005642  001002                            BNE     2$              ;BRANCH IF SET
14200 005644  104001                            ERROR                   ;NOT SET, ERROR
14300 005646  000410                            BR      3$              ;CHAIN TO NEXT TEST
14400 005650  042777  000100  172740    2$:     BIC     #BIT6,@TPS      ;CLEAR INTERRUPT ENABLE BIT
14500 005656  032777  000100  172732            BIT     #BIT6,@TPS      ;CHECK IF BIT IS CLEARED
14600 005664  001401                            BEQ     3$              ;BRANCH IF CLEARED
14700 005666  104001                            ERROR                   ;NOT CLEARED, ERROR
14800 005670  104005                    3$:     CHAIN                   ;CHAIN TO NEXT TEST
14900 005672  000755                            BR      1$              ;DO AGAIN
15000
15100                                   ;**********
15200                                   ;AT7--  TEST #47--TESTS THE ABILITY TO CLEAR TRANSMITTER
15300                                   ;       INTERRUPT ENABLE BIT WITH RESET INSTRUCTION.
15400                                   ;**********
15500
15600 005674  000047                    AT7:    47                      ;TEST NUMBER
15700 005676  005744                            AT10                    ;NEXT TEST
15800 005700  000012                            10.                     ;ITERATION COUNT
15900 005702  005716                            1$                      ;SCOPE ENTRY
16000 005704  012746  000340                      MOV     #PRTY7,-(SP)  ;SET PRIORITY TO 7
16100 005710  012746  005716                      MOV     #1$,-(SP)
16200 005714  000002                            RTI
16300 005716  052777  000100  172672    1$:     BIS     #BIT6,@TPS      ;SET INTERRUPT BIT
16400 005724  000005                            RESET                   ;RESET
16500 005726  032777  000100  172662            BIT     #BIT6,@TPS      ;CHECK IF BIT IS CLEARED
16600 005734  001401                            BEQ     2$              ;BRANCH IF CLEARED
16700 005736  104001                            ERROR                   ;ERROR, RESET DID NOT CLEAR BIT
16800 005740  104005                    2$:     CHAIN                   ;CHAIN TO NEXT ROUTINE
16900 005742  000765                            BR      1$              ;REPEAT TEST
```

```
17100                                   ;**********
17200                                   ;AT10-- TEST #50--CHECKS THAT RESET SETS THE TRANSMITTER
17300                                   ;       READY BIT AND THAT THE READY BIT CAN BE READ RELIABLY.
17400                                   ;**********
17500
17600 005744  000050                    AT10:   50                      ;TEST NUMBER
17700 005746  006002                            AT11                    ;NEXT TEST
17800 005750  000012                            10.                     ;ITERATION COUNT
17900 005752  005754                            1$                      ;SCOPE ENTRY
18000 005754  032777  001000  172732    1$:     BIT     #LSI11,@SR      ;SKIP TEST IF AN LSI-11
18100 005762  001005                            BNE     2$
18200 005764  000005                            RESET                   ;RESET
18300 005766  105777  172624                    TSTB    @TPS            ;CHECK TRANSMIT READY BIT
18400 005772  100401                            BMI     2$              ;BRANCH IF SET
18500 005774  104001                            ERROR                   ;ERROR, RESET DID NOT SET READY BIT
18600 005776  104005                    2$:     CHAIN                   ;CHAIN TO NEXT TEST
18700 006000  000765                            BR      1$              ;DO AGAIN
18800
18900                                   ;**********
19000                                   ;AT11-- TEST #51--TESTS THAT THE TRANSMITTER READY RESETS
19100                                   ;       BY LOADING THE TRANSMITTER BUFFER.
19200                                   ;**********
19300
19400 006002  000051                    AT11:   51                      ;TEST NUMBER
19500 006004  006042                            AT12                    ;NEXT TEST
19600 006006  000012                            10.                     ;ITERATION COUNT
19700 006010  006012                            1$                      ;SCOPE ENTRY
19800 006012  012700  000226            1$:     MOV     #226,R0
19900 006016  104010                            DELAY                   ;DELAY 150 MSEC.
20000 006020  000005                            RESET                   ;RESET
20100 006022  005077  172572                    CLR     @TPB            ;LOAD TRANSMITTER BUFFER
20200 006026  105777  172564                    TSTB    @TPS            ;CHECK TRANSMIT READY BIT
20300 006032  100001                            BPL     2$              ;BRANCH IF CLEARED
20400 006034  104001                            ERROR                   ;NOT CLEARED, ERROR
20500 006036  104005                    2$:     CHAIN                   ;CHAIN TO NEXT TEST
20600 006040  000764                            BR      1$              ;REPEAT TEST
```

```
20800                                   ;**********
20900                                   ;AT12-- TEST #52--CHECKS THAT THE TRANSMIT READY BIT CAN
21000                                   ;       CAUSE AN INTERRUPT
21100                                   ;**********
21200
21300 006042  000052                    AT12:   52                      ;TEST NUMBER
21400 006044  006116                            AT13                    ;NEXT TEST
21500 006046  000012                            10.                     ;ITERATION COUNT
21600 006050  006056                            1$                      ;SCOPE ENTRY
21700 006052  104004                            STPCHV                  ;SET UP TRANSMITTER INTERRUPT VECTOR
21800 006054  006112                            4$                      ;TO 4$
21900 006056  000005                    1$:     RESET                   ;SEE CHAINY COMMENT
22000 006060  005077  172532                    CLR     @TPS            ;DISABLE TRANSMIT INTERRUPT
22100 006064  005046                            CLR     -(SP)           ;SET PRIORITY TO ZERO
22200 006066  012746  006074                    MOV     #2$,-(SP)
22300 006072  000002                            RTI
22400 006074  052777  000100  172514    2$:     BIS     #BIT6,@TPS      ;ENABLE TRANSMIT INTERRUPT
22500 006102  000240                            NOP
22600 006104  104001                            ERROR                   ;TRANSMIT READY DID NOT CAUSE INTERRUPT
22700 006106  104005                    3$:     CHAIN                   ;CHAIN TO NEXT TEST
22800 006110  000762                            BR      1$              ;REPEAT TEST
22900 006112  022626                    4$:     POPSP2                  ;INTERRUPT OCCURRED, CLEAN STACK
23000 006114  000774                            BR      3$              ;CHAIN TO NEXT TEST
23100
23200                                   ;**********
23300                                   ;AT13-- TEST#53--TESTS THAT THE TRANSMIT READY DOES NOT CAUSE AN
23400                                   ;       INTERRUPT WHEN THE PROCESSOR IS AT THE SAME LEVEL
23500                                   ;**********
23600
23700 006116  000035                    AT13:   35                      ;TEST NUMBER
23800 006120  006176                            AT14                    ;NEXT TEST
23900 006122  000012                            10.                     ;ITERATION COUNT
24000 006124  006132                            1$                      ;SCOPE ENTRY
24100 006126  104004                            STPCHV                  ;SET UP TRANSMIT INTERRUPT
24200 006130  006170                            4$                      ;VECTOR TO 4$
24300 006132  016746  172472              1$:   MOV     TPLVL,-(SP)     ;SET PROCESSOR TO SAME LEVEL AS XMITTER
24400 006136  012746  006144                    MOV     #2$,-(SP)
24500 006142  000002                            RTI
24600 006144  005077  172446              2$:   CLR     @TPS            ;DISABLE TRANSMITTER INTERRUPTS
24700 006150  052777  000100  172440            BIS     #BIT6,@TPS      ;ENABLE TRANSMITTER INTERRUPTS
24800 006156  000240                            NOP
24900 006160  005077  172432              3$:   CLR     @TPS            ;OK, NO INTERRUPT OCCURRED
25000 006164  104005                            CHAIN                   ;CHAIN TO NEXT TEST
25100 006166  000761                            BR      1$              ;REPEAT TEST
25200 006170  022626                    4$:     POPSP2                  ;INTERRUPT OCCURRED,ERROR,CLEAN
25300 006172  104001                            ERROR                   ;UP STACK
25400 006174  000771                            BR      3$              ;CHAIN TO NEXT TEST
```

```
25600                                   ;**********
25700                                   ;AT14-- TEST#54--TESTS THAT THE TRANSMIT READY DOES CAUSE AN
25800                                   ;       INTERRUPT WHEN THE PROCESSOR IS AT A PRIORITY LEVEL
25900                                   ;       ONE LOWER THAN THE TRANSMIT INTERRUPT REQUEST LEVEL
26000                                   ;**********
26100
26200 006176  000054                    AT14:   54                      ;TEST NUMBER
26300 006200  006262                            AT15                    ;NEXT TEST
26400 006202  000012                            10.                     ;ITERATION COUNT
26500 006204  006212                            1$                      ;SCOPE ENTRY
26600 006206  104004                            STPCHV                  ;SET UP TRANSMIT INTERRUPT
26700 006210  006250                            3$                      ;VECTOR TO 3$
26800 006212  005077  172400              1$:   CLR     @TPS              ;DISABLE TRANSMIT INTERRUPTS
26900 006216  016746  172406                    MOV     TPLVL,-(SP)       ;SET PROCESSOR PRIORITY ONE
27000 006222  162716  000040                    SUB     #40,(SP)          ;LEVEL LOWER THAN TRANSMITTER
27100 006226  012746  006234                    MOV     #2$,-(SP)
27200 006232  000002                            RTI
27300 006234  052777  000100  172354  2$:       BIS     #BIT6,@TPS        ;ENABLE TRANSMITTER INTERRUPTS
27400 006242  000240                            NOP
27500 006244  104001                            ERROR                   ;NO INTERRUPT, ERROR
27600 006246  000401                            BR      4$              ;CHAIN TO NEXT TEST
27700 006250  022626                    3$:     POPSP2                  ;INTERRUPT OCCURED, OK, CLEAN STACK
27800 006252  005077  172340              4$:   CLR     @TPS              ;DISABLE TRANSMITTER INTERRUPTS
27900 006256  104005                            CHAIN                   ;CHAIN TO NEXT TEST
28000 006260  000754                            BR      1$              ;REPEAT TEST
```

```
                                ;**********
                                ;AT15-- TEST#55--TESTS THAT THE TRANSMIT READY DOES NOT
                                ;       REINTERRUPT AFTER AN RTI WHEN THE READY BIT HAS
                                ;       NOT BEEN RESET.
                                ;**********

006262  000055          AT15:   55                      ;TEST NUMBER
006264  006362                  AT16                    ;NEXT TEST
006266  000012                  10.                     ;ITERATION COUNT
006270  006272                  1$                      ;SCOPE ENTRY
006272  104004          1$:     STPCHV                  ;SET TRANSMIT INTERRUPT VECTOR
006274  006334                  4$                      ;TO 4$
006276  005077  172314          CLR     @TPS            ;DISABLE TRANSMITTER INTERRUPTS
006302  005046                  CLR     -(SP)           ;SET PROCESSOR PRIORITY TO ZERO
006304  012746  006312          MOV     #2$,-(SP)
006310  000002                  RTI
006312  052777  000100  172276  2$:     BIS     #BIT6,@TPS      ;ENABLE TRANSMITTER INTERRUPTS
006320  000240                  NOP
006322  104001                  ERROR                   ;ERROR1, TRANSMITTER FAILED TO INTERRUPT
006324  005077  172266          3$:     CLR     @TPS            ;DISABLE TRANSMITTER INTERRUPTS
006330  104005                  CHAIN                   ;CHAIN TO NEXT TEST
006332  000757                  BR      1$              ;REPEAT TEST
006334  012777  006354  172264  4$:     MOV     #6$,@TPVTR      ;INTERRUPT OCCURRED, CHANGE INTERRUPT
006342  012716  006350          MOV     #5$,@SP         ;VECTOR TO 6$ AND RETURN TO 5$
006346  000002                  RTI                     ;RETURN FROM INTERRUPT
006350  000240          5$:     NOP
006352  000764                  BR      3$              ;CHAIN TO NEXT TEST
006354  022626          6$:     POPSP2                  ;ERROR2, TRANSMITTER REINTERRUPTED
006356  104001                  ERROR                   ;AFTER RTI WITH READY BIT LEFT ON.
006360  000761                  BR      3$              ;CLEAN STACK, CHAIN TO NEXT TEST.

                                ;**********
                                ;AT16--TEST#56--CHECKS THAT RESET CLEARS THE RECEIVER DONE BIT
                                ;**********

006362  000056          AT16:   56                      ;TEST NUMBER
006364  006430                  AT17                    ;NEXT TEST
006366  000012                  10.                     ;ITERATION COUNT
006370  006372                  1$                      ;SCOPE ENTRY
006372  032777  001000  172314  1$:     BIT     #LSI11,@SR      ;SKIP TEST IF LSI-11
006400  001011                  BNE     3$
006402  012700  000226          MOV     #226,R0
006406  104010                  DELAY                   ;DELAY 150 MSEC.
006410  104021          2$:     AREAD                   ;ENABLE RECEIVER
006412  000005                  RESET                   ;RESET
006414  105777  172172          TSTB    @TKS            ;TEST DONE BIT
006420  100001                  BPL     3$              ;BRANCH IF DONE IS CLEARED
006422  104001                  ERROR                   ;NOT CLEARED, ERROR
006424  104005          3$:     CHAIN                   ;CHAIN TO NEXT TEST
006426  000761                  BR      1$              ;REPEAT TEST
```

```
                                ;**********
                                ;AT17-- TEST#57--CHECKS THAT REFERENCING THE RECEIVER BUFFER
                                ;       CLEARS THE DONE BIT.
                                ;**********

006430  000057                  AT17:   57                      ;TEST NUMBER
006432  006500                          AT20                    ;NEXT TEST
006434  000012                          10.                     ;ITERATION COUNT
006436  006440                          1$                      ;SCOPE ENTRY
006440  032777  001000  172246  1$:     BIT     #LSI11,@SR      ;CHECK FOR LSI-11
006446  001012                          BNE     3$              ;SKIP TEST IF SET
006450  012700  000226                  MOV     #226,R0
006454  104010                          DELAY                   ;DELAY 150 MSEC.
006456  104021                  2$:     AREAD                   ;ENABLE RECEIVER
006460  105777  172130                  TSTB    @TKB            ;REFERENCE RECEIVER BUFFER
006464  105777  172122                  TSTB    @TKS            ;TEST DONE BIT
006470  100001                          BPL     3$              ;BRANCH IF NOT SET
006472  104001                          ERROR                   ;DONE BIT IS SET, ERROR
006474  104005                  3$:     CHAIN                   ;CHAIN TO NEXT TEST
006476  000760                          BR      1$              ;REPEAT TEST

                                ;**********
                                ;AT20-- TEST#60--CHECK THAT THE RECEIVER DONE BIT IS ABLE TO
                                ;       CAUSE AN INTERRUPT.
                                ;**********

006500  000060                  AT20:   60                      ;TEST NUMBER
006502  006572                          AT21                    ;NEXT TEST
006504  000012                          10.                     ;ITERATION COUNT
006506  006514                          1$                      ;SCOPE ENTRY
006510  104003                          STRDRV                  ;SET UP RECEIVER INTERRUPT
006512  006564                          4$                      ;VECTOR TO 4$
006514  032777  001000  172172  1$:     BIT     #LSI11,@SR      ;CHECK FOR LSI-11
006522  001021                          BNE     5$              ;SKIP TEST IF SET
006524  012700  000226                  MOV     #226,R0
006530  104010                          DELAY                   ;DELAY 150 MSEC
006532  104021                          AREAD                   ;ENABLE RECEIVER
006534  005077  172052          2$:     CLR     @TKS            ;DISABLE RECEIVER INTERRUPTS
006540  005046                          CLR     -(SP)           ;SET PROCESS STATUS TO ZERO
006542  012746  006550                  MOV     #3$,-(SP)
006546  000002                          RTI
006550  052777  000100  172034  3$:     BIS     #BIT6,@TKS      ;ENABLE RECEIVER INTERRUPT
006556  000240                          NOP
006560  104001                          ERROR                   ;ERROR,RECEIVER FAILED TO INTERRUPT
006562  000401                          BR      5$              ;CHAIN TO NEXT TEST
006564  022626                  4$:     POPSP2                  ;OK, CLEAN STACK
006566  104005                  5$:     CHAIN                   ;CHAIN TO NEXT TEST
006570  000751                          BR      1$              ;REPEAT TEST
```

```
                                ;**********
                                ;AT21-- TEST#61--TESTS THAT THE RECEIVER DONE DOES NOT CAUSE AN
                                ;       INTERRUPT WHEN THE PROCESSOR IS AT THE SAME LEVEL AS
                                ;       THE RECEIVER'S INTERRUPT REQUEST LEVEL.
                                ;**********

006572  000061          AT21:   61                      ;TEST NUMBER
006574  006672                  AT22                    ;NEXT TEST
006576  000012                  10.                     ;ITERATION COUNT
006600  006606                  1$                      ;SCOPE ENTRY
006602  104003                  STRDRV                  ;SET RECEIVER VECTOR TO 5$
006604  006664                  5$
006606  032777  001000  172100 1$:     BIT     #LSI11,@SR      ;CHECK FOR LSI-11
006614  001017                  BNE     4$              ;SKIP TEST IF SET
006616  012700  000226          MOV     #226,R0
006622  104010                  DELAY                   ;DELAY 150 MSEC
006624  104021                  AREAD                   ;ENABLE RECEIVER
006626  005077  171760          2$:     CLR     @TKS            ;DISABLE RECEIVER INTERRUPTS
006632  016746  171766          MOV     TKLVL,-(SP)     ;SET PROCESSOR PRIORITY TO SAME LEVEL AS RECEIVER
006636  012746  006644          MOV     #3$,-(SP)
006642  000002                  RTI
006644  052777  000100  171740 3$:     BIS     #BIT6,@TKS      ;ENABLE RECEIVER INTERRUPTS
006652  000240                  NOP
006654  005077  171732          4$:     CLR     @TKS            ;OK, NO INTERRUPT OCCURRED
006660  104005                  CHAIN                   ;CHAIN TO NEXT TEST
006662  000751                  BR      1$              ;REPEAT TEST
006664  022626          5$:     POPSP2                  ;ERROR, RECEIVER INTERRUPTED, CLEAN STACK
006666  104001                  ERROR
006670  000771                  BR      4$              ;BRANCH 4$
```

```
                                        ;**********
                                        ;AT22-- TEST#62--TESTS THAT THE RECEIVER DONE DOES CAUSE AN
                                        ;       INTERRUPT WHEN THE PROCESSOR IS AT A PRIORITY ONE
                                        ;       LEVEL LOWER THAN THE RECEIVER'S INTERRUPT
                                        ;       REQUEST LEVEL
                                        ;**********

006672  000062                  AT22:   62                      ;TEST NUMBER
006674  007000                          AT23                    ;NEXT TEST
006676  000012                          10.                     ;ITERATION COUNT
006700  006706                          1$                      ;SCOPE ENTRY
006702  104003                          STRDRV                  ;SET RECEIVER INTERRUPT
006704  006766                          4$                      ;VECTOR TO 4$
006706  032777  001000  172000  1$:     BIT     #LSI11,@SR      ;CHECK FOR LSI11
006714  001025                          BNE     5$              ;SKIP TEST IF SET
006716  012700  000226                  MOV     #226,R0
006722  104010                          DELAY                   ;DELAY 150 MSEC
006724  104021                          AREAD                   ;ENABLE RECEIVER
006726  005077  171660          2$:     CLR     @TKS            ;DISABLE READER INTERRUPTS
006732  016746  171666                  MOV     TKLVL,-(SP)     ;SET PROCESSOR PRIORITY ONE LEVEL
006736  012746  006744                  MOV     #3$,-(SP)
006742  000002                          RTI
006744  162767  000040  171024  3$:     SUB     #40,PSW         ;LOWER THAN READER
006752  052777  000100  171632          BIS     #BIT6,@TKS      ;ENABLE INTERRUPTS
006760  000240                          NOP
006762  104001                          ERROR                   ;FAILED TO INTERRUPT
006764  000401                          BR      5$              ;CHAIN TO NEXT TEST
006766  022626                  4$:     POPSP2                  ;OK, CLEAN STACK
006770  005077  171616          5$:     CLR     @TKS            ;DISABLE RECEIVER INTERRUPTS
006774  104005                          CHAIN                   ;CHAIN TO NEXT TEST
006776  000743                          BR      1$              ;REPEAT TEST
```

```
                                ;**********
                                ;AT23-- TEST#63--CHECKS THAT THE RECEIVER DONE DOES NOT
                                ;       REINTERRUPT AFTER RTI INSTRUCTION WHEN DONE
                                ;       BIT IS LEFT SET.
                                ;**********

007000  000063          AT23:   63                      ;TEST NUMBER
007002  007112                  AT24                    ;NEXT TEST
007004  000012                  10.                     ;ITERATION COUNT
007006  007010                  1$                      ;SCOPE ENTRY
007010  032777  001000  171676 1$:     BIT     #LSI11,@SR      ;CHECK FOR LSI-11
007016  001015                  BNE     3$              ;SKIP TEST IF SET
007020  012700  000226          2$:     MOV     #226,R0
007024  104010                  DELAY                   ;DELAY 150 MSEC
007026  104021                  AREAD                   ;ENABLE RECEIVER
007030  104003                  STRDRV                  ;SET RECEIVER INTERRUPT
007032  007064                  4$                      ;VECTOR TO 4$
007034  005077  171552          CLR     @TKS            ;DISABLE RECEIVER INTERRUPTS
007040  052777  000100  171544  BIS     #BIT6,@TKS      ;ENABLE RECEIVER INTERRUPT
007046  000240                  NOP                     ;
007050  104001                  ERROR                   ;NO INTERRUPT, ERROR
007052  005077  171534          3$:     CLR     @TKS            ;DISABLE RECEIVER INTERRUPTS
007056  000005                  RESET                   ;RESET AFTER LAST INTERRUPT
007060  104005                  CHAIN                   ;CHAIN TO NEXT TEST
007062  000752                  BR      1$              ;REPEAT TEST
007064  012777  007104  171530  4$:     MOV     #6$,@TKVTR      ;INTERRUPT, OK, CHANGE VECTOR TO 6$
007072  012716  007100          MOV     #5$,@SP         ;CHANGE RET ADDR TO 5$
007076  000002                  RTI                     ;RETURN
007100  000240          5$:     NOP
007102  000763                  BR      3$              ;OK, NO ADDITIONAL INTERRUPT
007104  022626          6$:     POPSP2                  ;ERROR, ADDITIONAL INTERRUPT
007106  104001                  ERROR
007110  000760                  BR      3$              ;CHAIN TO NEXT TEST
```

```
 47800                                  ;**********
 47900                                  ;AT24--TEST#64--HAVE OPERATOR TYPE A CHARACTER ON THE
 48000                                  ;               KEYBOARD, THEN CHECK FOR RECEIVER DONE.
 48100                                  ;
 48200                                  ;               ALLOW 12 SECONDS FOR OPERATOR RESPONSE.
 48300                                  ;**********
 48400
 48500 007112  000064                   AT24:   64                      ;TEST NUMBER
 48600 007114  007212                           AT25                    ;NEXT TEST
 48700 007116  000001                           1                       ;ITERATION COUNT
 48800 007120  007122                           1$                      ;SCOPE ENTRY
 48900 007122  032777  001000  171564     1$:     BIT     #LSI11,@SR      ;SKIP TEST IF NOT AN LSI-11
 49000 007130  001426                           BEQ     5$
 49100 007132  005777  171454                   TST     @TKS            ;SHOULD BE CLEAR
 49200 007136  001401                           BEQ     2$
 49300 007140  104001                           ERROR                   ;RECEIVER STATUS NOT =0
 49400 007142  012700  000600             2$:     MOV     #600,R0         ;1/2 SEC DELAY
 49500 007146  012767  000030  171542           MOV     #30,CNTR        ;SET UP FOR 12 SEC WAIT
 49600 007154  104000                           TYPE
 49700 007156  014401                           OPMSG                   ;MESSAGE TO TYPE A CHARACTER
 49800 007160  104010                     3$:   DELAY                   ;1/2 SECOND
 49900 007162  105777  171424                   TSTB    @TKS            ;CHECK DONE BIT
 50000 007166  100407                           BMI     5$              ;SET - EXIT LOOP
 50100 007170  005367  171522                   DEC     CNTR
 50200 007174  001403                           BEQ     4$              ;TIME HAS RUN OUT...
 50300 007176  012700  000600                   MOV     #600,R0         ;ANOTHER 1/2 SEC
 50400 007202  000766                           BR      3$              ;CONTINUE WAIT
 50500 007204  104001                     4$:   ERROR                   ;NO RECEIVER DONE, OR
 50600                                                                  ;OPERATOR DID NOT RESPOND
 50700 007206  104005                     5$:   CHAIN                   ;CHAIN TO NEXT TEST
 50800 007210  000744                           BR      1$
```

```
                                        ;**********
                                        ;AT25--TEST#65--CHECK THAT RECEIVER DONE CAUSES AN INTERRUPT
                                        ;               WHEN BIT 6 (INTERRUPT ENABLE) IS SET.
                                        ;**********

007212  000065                  AT25:   65                      ;TEST NUMBER
007214  007270                          AT26                    ;NEXT TEST
007216  000001                          1                       ;ITERATION COUNT
007220  007222                          1$                      ;SCOPE ENTRY
007222  032777  001000  171464  1$:     BIT     #LSI11,@SR      ;SKIP TEST IF NOT AN LSI-11
007230  001415                          BEQ     6$
007232  105777  171354          2$:     TSTB    @TKS            ;DONE SHOULD BE SET
007236  001001                          BNE     3$
007240  104001                          ERROR                   ;RECEIVER DONE NOT SET
007242  104003                  3$:     STRDRV                  ;SET RECEIVER INTERRUPT
007244  007262                          5$                      ;VECTOR TO 5$
007246  052777  000100  171336          BIS     #BIT6,@TKS      ;ENABLE INTERRUPT
007254  000240                          NOP
007256  000240                          NOP
007260  104001                  4$:     ERROR                   ;RECEIVER DID NOT INTERRUPT
007262  022626                  5$:     POPSP2                  ;CLEAN UP THE STACK
007264  104005                  6$:     CHAIN                   ;CHAIN TO NEXT TEST

007266  000755                          BR      1$
```

```
53500                                   ;**********
53600                                   ;AT26--TEST#66--CHECK THAT READING TKB CLEARS DONE BIT
53700                                   ;               AND THAT DONE CLEARED DOES NOT CAUSE AN INTERRUPT
53800                                   ;**********
53900
54000 007270  000066                    AT26:   66                      ;TEST NUMBER
54100 007272  177777                            -1                      ;LAST TEST
54200 007274  000001                            1                       ;ITERATION COUNT
54300 007276  007300                            1$                      ;SCOPE ENTRY
54400 007300  032777  001000  171406      1$:     BIT     #LSI11,@SR      ;SKIP TEST IF NOT AN LSI-11
54500 007306  001422                            BEQ     5$
54600 007310  105777  171276              2$:     TSTB    @TKS            ;MAKE SURE DONE IS STILL SET
54700 007314  001001                            BNE     3$
54800 007316  104001                            ERROR                   ;RECEIVER DONE NOT SET
54900 007320  017767  171270  171370      3$:     MOV     @TKB,CNTR       ;READ DATA BUFFER
55000 007326  105777  171260                    TSTB    @TKS            ;CHECK THE DONE BIT
55100 007332  100001                            BPL     4$              ;OK
55200 007334  104001                            ERROR                   ;READING DATA BUFFER DID NOT CLEAR DONE
55300 007336  104003                    4$:     STRDRV                  ;SET RECEIVER INTERRUPT
55400 007340  007364                            6$                      ;VECTOR TO 6$
55500 007342  052777  000100  171242            BIS     #BIT6,@TKS      ;ENABLE INTERRUPT
55600 007350  000240                            NOP
55700 007352  000240                            NOP
55800 007354  005077  171232              5$:     CLR     @TKS            ;OK- CLEAN UP
55900 007360  104005                            CHAIN                   ;EXIT TESTS
56000 007362  000746                            BR      1$
56100 007364  104001                    6$:     ERROR                   ;DLV INTERRUPTED WITH DONE CLEAR
56200 007366  022626                            POPSP2                  ;CLEAN UP THE STACK
56300 007370  000771                            BR      5$              ;EXIT TESTS
```

```
56500
```

```
                                .SBTTL  LA36 PRINTER TESTS
                        ;
                        ;THE LA36 PRINTER TESTS WILL BE EXECUTED IN A
                        ;CONTINOUS LOOP OUTPUTTING TO ALL MULTIPLE DL11'S
                        ;IF SR BIT 8 IS SET TO ZERO AT START UP TIME.  IF
                        ;BIT 8 IS SET TO 1 AT START UP THEY MAY BE EXECUTED
                        ;INDIVIDUALLY ONCE OR CONTINUALLY LOOPED, OR
                        ;BECOME THE FIRST OF THE ENTIRE SEQUENCE OF PRINTER
                        ;TESTS.  REFERENCE INTRUCTIONS IN THE INTRODUCTION
                        ;FOR PROPER MODE OF OPERATION.
                        ;
                        ;
                        ;XXXXXXXXXX
                        ;
                        ;PT0 -- DATA PATH TEST---FOUR LINES OF ALTERNATING
                        ;       "*" AND "U" ARE PRINTED, OUT TO THE GIVEN PAPER
                        ;       WIDTH.  THE PATTERN WILL APPEAR AS FOLLOWS.
                        ;
                        ;       *U*U*U*U*U*U
                        ;       U*U*U*U*U*U*
                        ;       *U*U*U*U*U*U
                        ;       U*U*U*U*U*U*
                        ;
                        ;XXXXXXXXXX
                        ;
007372  000000          PT0:    0                       ;TEST NUMBER
007374  007446                  PT1                     ;NEXT TEST
007376  104016                  PRTHDR                  ;
007400  104007                  TYPEM                   ;PRINT COLUMN # MESG
007402  014127                  HDR0
007404  012703  025125  1$:     MOV     #'U*,R3         ;SET FIRST CHAR PAIR
007410  012702  000004          MOV     #4,R2           ;SET LINE COUNT
007414  010300          2$:     MOV     R3,R0           ;SET CHAR PAIR
007416  016701  171230          MOV     WIDTH,R1        ;SET COLUMN COUNT
007422  104015          3$:     PRINTC                  ;PRINT CHAR
007424  000300                  SWAB    R0              ;SET NEXT CHAR
007426  005301                  DEC     R1              ;DEC COLUMN COUNT
007430  001374                  BNE     3$              ;FINISH LINE
007432  000303                  SWAB    R3              ;SET NEXT LINE START CHAR
007434  104012                  CRLF                    ;SEND CR-LF
007436  005302                  DEC     R2              ;DEC LINE COUNT
007440  001365                  BNE     2$              ;FINISH TEST
007442  104005                  CHAIN                   ;ALL DONE, EXIT
007444  000757                  BR      1$              ;REPEAT TEST
```

```
                                        ;XXXXXXXXXX
                                        ;
                                        ;PT1 -- PRINTER CHARACTER TEST --- PRINTS ALL PRINTABLE CHARACTERS
                                        ;
                                        ;XXXXXXXXXX

007446  000001          PT1:    1                       ;TEST NUMBER
007450  007570                  PT2                     ;NEXT TEST
007452  104016                  PRTHDR
007454  012701  000040  1$:     MOV     #40,R1          ;SPACE TO R1
007460  012702  000100          MOV     #100,R2         ;@ TO R2
007464  012703  000140          MOV     #140,R3         ;\ TO R3
007470  110100          2$:     MOVB    R1,R0           ;CHAR TO R0
007472  004767  000042          JSR     PC,SPSP         ;SEND TWO SPACES
007476  110200                  MOVB    R2,R0           ;NEXT CHAR TO R0
007500  004767  000034          JSR     PC,SPSP         ;SEND TWO SPACES
007504  012704  000003          MOV     #3,R4           ;PRINT COUNT TO R4
007510  110300                  MOVB    R3,R0           ;THIRD CHAR TO R0
007512  104015          3$:     PRINTC                  ;PRINT THE CHAR
007514  005304                  DEC     R4              ;THREE TIMES ?
007516  001375                  BNE     3$              ;BRANCH IF NOT
007520  104012                  CRLF                    ;CARRIAGE RETURN LINE FEED
007522  122122                  CMPB    (R1)+,(R2)+     ;NEXT CHARACTERS
007524  105723                  TSTB    (R3)+
007526  020327  000200          CMP     R3,#200         ;CHECK IF ALL DONE
007532  103756                  BLO     2$              ;BRANCH IF NOT
007534  104005                  CHAIN                   ;EXIT TO NEXT TEST
007536  000746                  BR      1$              ;REPEAT TEST
007540  012704  000003  SPSP:   MOV     #3,R4           ;PRINT COUNT TO R4
007544  104015          1$:     PRINTC                  ;PRINT CHAR
007546  005304                  DEC     R4              ;THREE TIMES?
007550  001375                  BNE     1$              ;BRANCH IF NOT
007552  012700  000040  SP2:    MOV     #40,R0          ;SPACE TO R0
007556  104015                  PRINTC                  ;SEND A SPACE
007560  012700  000040  SPC:    MOV     #40,R0          ;SPACE TO R0
007564  104015                  PRINTC                  ;SEND ANOTHER
007566  000207                  RTS     PC              ;RETURN
```

```
 8400                           ;XXXXXXXXXX
 8500                           ;
 8600                           ;PT2 -- NON-PRINTING CHARACTER TEST.  THIS TEST
 8700                           ;       PRINTS THE OCTAL CODE FOLLOWED BY THE MNEMONIC
 8800                           ;       OF ALL NON-PRINTING CHARACTERS.  FOLLOWING EACH
 8900                           ;       MNEMONIC, THE PRINTER IS DRIVEN BY THE NON-PRINTING
 9000                           ;       CODE (000 THROUGH 037 PLUS 177)
 9100                           ;       ALL CONTROL CHARACTERS (INCLUDING THOSE FOR OPTIONS
 9200                           ;       WILL BE SKIPPED, REFER TO THE DOCUMENT FOR A LIST OF THOSE
 9300                           ;       TESTED.
 9400                           ;
 9500                           ;XXXXXXXXXX
 9600                           ;
 9700 007570  000002            PT2:    2                       ;TEST NUMBER
 9800 007572  010164                    PT3                     ;NEXT TEST
 9900 007574  104016                    PRTHDR                  ;PRINT TEST HEADER
10000 007576  012701  007676     1$:     MOV     #IDEZ,R1        ;ADDR OF IDENT TO R1
10100 007602  012703  010137             MOV     #NPCODE,R3      ;ADDR OF NON-PRINT-CODES TO R3
10200 007606  012702  000003     2$:     MOV     #3,R2           ;NO. OF ID'S PER LINE TO R2
10300 007612  012704  000010     3$:     MOV     #10,R4          ;NO. OF CHARS PER ID TO R4
10400 007616  121327  000055     4$:     CMPB    (R3),#55        ;ZERO TERMINATOR IN NP TABLE?
10500 007622  001422                    BEQ     7$              ;BRANCH IF YES
10600 007624  112100                    MOVB    (R1)+,R0        ;GET ID CHARACTERS
10700 007626  104015                    PRINTC                  ;AND PRINT A
10800 007630  005304                    DEC     R4              ;GROUP OF
10900 007632  001371                    BNE     4$              ;8 CHARACTERS
11000 007634  112300                    MOVB    (R3)+,R0        ;GET NP CODE FROM TABLE
11100 007636  012704  000003             MOV     #3,R4           ;AND
11200 007642  104015     5$:            PRINTC                  ;TRY TO PRINT IT
11300 007644  005304                    DEC     R4              ;THREE
11400 007646  001375                    BNE     5$              ;TIMES
11500 007650  005302                    DEC     R2              ;MORE TO GO ON THIS LINE ?
11600 007652  001404                    BEQ     6$              ;BRANCH IF NO
11700 007654  004767  177672             JSR     PC,SP2          ;SEND 3 SPACES
11800 007660  104015                    PRINTC
11900 007662  000753                    BR      3$              ;BRANCH TO CONTINUE LINE
12000 007664  104012     6$:            CRLF
12100 007666  000747                    BR      2$              ;GO DO NEXT LINE
12200 007670  104012     7$:            CRLF
12300 007672  104005                    CHAIN                   ;CHAIN TO NEXT TEST
12400 007674  000740                    BR      1$
12500
12600
12700
12800 007676    060     060     060  IDEZ:   .ASCII  /000  NUL001  SOH002  STX/
      007701    040     040     116
      007704    125     114     060
      007707    060     061     040
      007712    040     123     117
      007715    110     060     060
      007720    062     040     040
      007723    123     124     130
12900 007726    060     060     066          .ASCII  /006  ACK020  DLE021  DC1/
      007731    040     040     101
      007734    103     113     060
      007737    062     060     040
      007742    040     104     114
```

```
                007745  105     060     062
                007750  061     040     040
                007753  104     103     061
13000           007756  060     062     062             .ASCII  /022  DC2023  DC3024  DC4/
                007761  040     040     104
                007764  103     062     060
                007767  062     063     040
                007772  040     104     103
                007775  063     060     062
                010000  064     040     040
                010003  104     103     064
13100           010006  060     062     065             .ASCII  /025  NAK026  SYN027  ETB/
                010011  040     040     116
                010014  101     113     060
                010017  062     066     040
                010022  040     123     131
                010025  116     060     062
                010030  067     040     040
                010033  105     124     102
13200           010036  060     063     060             .ASCII  /030  CAN031  EM 032  SUB/
                010041  040     040     103
                010044  101     116     060
                010047  063     061     040
                010052  040     105     115
                010055  040     060     063
                010060  062     040     040
                010063  123     125     102
13300           010066  060     063     064             .ASCII  /034  FS 035  GS 036  RS /
                010071  040     040     106
                010074  123     040     060
                010077  063     065     040
                010102  040     107     123
                010105  040     060     063
                010110  066     040     040
                010113  122     123     040
13400           010116  060     063     067             .ASCII  /037  US 177  DEL /
                010121  040     040     125
                010124  123     040     061
                010127  067     067     040
                010132  040     104     105
                010135  114     040
13500           010137  000     002     006     NPCODE: .BYTE   0,2,6,20,21,22,23,24
                010142  020     021     022
                010145  023     024
13600           010147  025     025     027             .BYTE   25,25,27,30,31,32,34,35
                010152  030     031     032
                010155  034     035
13700           010157  036     037     177             .BYTE   36,37,177,55
                010162  055
13800                                                   .EVEN
```

```
                                ;XXXXXXXXXX
                                ;
                                ;PT3 -- CARRIAGE RETURN TEST
                                ;
                                ;       THE LINE CONSISTS OF A STRING OF O'S AND
                                ;       X'S.  FIRST, THE O'S ARE PRINTED OUT TO THE LAST
                                ;       COLUMN WITH A SPACE SEPARATING EACH.  THEN THE
                                ;       CARRIAGE IS SPACED TO THE FIRST BLANK SPACE, AN X
                                ;       IS PRINTED AND THEN RETURNED TO THE MARGIN.  THIS
                                ;       PROCESS IS CONTINUE UNTIL ALL SPACES BETWEEN
                                ;       THE ZEROES HAVE BEEN FILLED.
                                ;
                                ;XXXXXXXXXX
010164  000003                  PT3:    3                       ;TEST NUMBER
010166  010304                          PT4                     ;NEXT TEST
010170  104016                          PRTHDR                  ;TYPE HEADER
010172  005067  170476          1$:     CLR     SPCNT           ;CLEAR SPACE COUNTER
010176  016701  170450                  MOV     WIDTH,R1        ;POSITION COUNTER TO R1
010202  012700  000117          2$:     MOV     #117,R0         ;'O'' TO R0
010206  104015                          PRINTC                  ;PRINT THE 'O''
010210  005301                          DEC     R1              ;DECREMENT POSITION COUNTER
010212  001404                          BEQ     3$              ;BRANCH IF 0
010214  004767  177340                  JSR     PC,SPC          ;SEND SPACE
010220  005301                          DEC     R1              ;DECREMENT POSITION COUNTER
010222  001367                          BNE     2$              ;BRANCH IF NOT ZERO
010224  104022                  3$:     CR                      ;SEND A CR
010226  012767  000001  170440          MOV     #1,SPCNT        ;SPACE, COUNTER SET TO 1
010234  016701  170434          4$:     MOV     SPCNT,R1        ;NO. OF SPACES TO R1
010240  004767  177314          5$:     JSR     PC,SPC          ;SEND SPACE
010244  005301                          DEC     R1              ;DECREMENT SPACE COUNTER
010246  001374                          BNE     5$              ;BRANCH IF NOT ZERO
010250  012700  000130                  MOV     #130,R0         ;'X'' INTO R0
010254  104015                          PRINTC                  ;PRINT 'X''
010256  104022                          CR                      ;PRINT CR
010260  062767  000002  170406          ADD     #2,SPCNT        ;INCREMENT SPACE COUNT BY 2
010266  026767  170402  170356          CMP     SPCNT,WIDTH     ;COMPARE POSITION COUNTER WITH COLM. COUNT
010274  103757                          BLO     4$              ;BRANCH IF LOWER
010276  104014                          LF                      ;SEND LF
010300  104005                          CHAIN                   ;CHAIN TO NEXT TEST
010302  000733                          BR      1$              ;REPEAT TEST
```

```
 18200                                  ;XXXXXXXXXX
 18300                                  ;
 18400                                  ;PT4 -- MULTIPLE LINE FEED TEST -- 63 LINE FEEDS ARE
 18500                                  ;       SENT WITH A REFERENCE LINE AT THE START AND END.
 18600                                  ;       A NUMBER IS PRINTED WHICH INDICATES THE NUMBER OF LINE
 18700                                  ;       FEEDS THAT WILL BE ISSUED BEFORE THE NEXT
 18800                                  ;       NUMBER OR REFERENCE LINE IS PRINTED.
 18900                                  ;
 19000                                  ;XXXXXXXXXX
 19100
 19200 010304  000004                   PT4:    4                       ;TEST NUMBER
 19300 010306  010462                           PT5                     ;NEXT TEST
 19400 010310  104016                           PRTHDR                  ;TYPE HEADER
 19500 010312  012767  000001  170366     1$:   MOV     #1,LFCNT        ;LINE FEED COUNT TO 1
 19600 010320  016701  170326                   MOV     WIDTH,R1        ;COLUMN COUNT TO R1
 19700 010324  012702  010444                   MOV     #LINE3,R2       ;ADDR OF NUMBER FIELD TO R2
 19800 010330  004767  000060                   JSR     PC,REF          ;PRINT REFERENCE LINE
 19900 010334  016701  170346             2$:   MOV     LFCNT,R1        ;LINE FEED COUNT TO R1
 20000 010340  104014                     3$:   LF                      ;SEND LF
 20100 010342  005301                           DEC     R1              ;DECREMENT COUNTER
 20200 010344  001375                           BNE     3$              ;BRANCH IF NOT YET 0
 20300 010346  006367  170334                   ASL     LFCNT           ;DOUBLE LINE FEED COUNT
 20400 010352  022767  000100  170326           CMP     #BIT6,LFCNT     ;TEST IF COUNT IS 32
 20500 010360  001406                           BEQ     4$              ;BRANCH IF =32, END
 20600 010362  112200                           MOVB    (R2)+,R0        ;NUMBER TO R0
 20700 010364  104015                           PRINTC                  ;PRINT IT
 20800 010366  112200                           MOVB    (R2)+,R0        ;NUMBER TO R0
 20900 010370  104015                           PRINTC                  ;PRINT IT
 21000 010372  104022                           CR                      ;PRINT CR
 21100 010374  000757                           BR      2$              ;DRIVE THE LINEFEEDS
 21200 010376  016701  170250             4$:   MOV     WIDTH,R1        ;COLUMN COUNT TO R1
 21300 010402  004767  000006                   JSR     PC,REF          ;SEND END REFERENCE LINE
 21400 010406  104014                           LF                      ;ADVANCE PAPER
 21500 010410  104005                           CHAIN
 21600 010412  000737                           BR      1$              ;REPEAT TEST
 21700 010414  112200                     REF:  MOVB    (R2)+,R0        ;NUMBER TO R0
 21800 010416  104015                           PRINTC                  ;PRINT IT
 21900 010420  112200                           MOVB    (R2)+,R0        ;NUMBER TO R0
 22000 010422  104015                           PRINTC                  ;PRINT IT
 22100 010424  005741                           TST     -(R1)           ;DECREASE COUNTER BY 2
 22200 010426  012700  000137                   MOV     #137,R0         ;DASH (-) TO R0
 22300 010432  104015                     1$:   PRINTC                  ;PRINT IT
 22400 010434  005301                           DEC     R1              ;DECREMENT COLUMN COUNTER
 22500 010436  001375                           BNE     1$              ;BRANCH IF NO ZERO
 22600 010440  104022                           CR                      ;PRINT CR
 22700 010442  000207                           RTS     PC              ;RETURN
 22800
 22900 010444    060     061     060    LINE3:  .ASCII  /01020408163200/
       010447    062     060     064
       010452    060     070     061
       010455    066     063     062
       010460    060     060
```

```
23100                                   ;XXXXXXXXXX
23200                                   ;PT5--  SINGLE LINE FEED TEST --  TESTS THE LINE FEED
23300                                   ;       CAPABILITY FROM ALL COLUMNS.
23400                                   ;XXXXXXXXXX
23500
23600 010462  000005            PT5:    5                       ;TEST NUMBER
23700 010464  010666                    PT6                     ;NEXT TEST
23800 010466  104016                    PRTHDR                  ;TYPE HEADER
23900 010470  016701  170156      1$:   MOV     WIDTH,R1        ;COLUMN COUNT TO R1
24000 010474  005741                    TST     -(R1)           ;DECREASE BY 2
24100 010476  012700  000060            MOV     #60,R0          ;'0' TO R0
24200 010502  104015            2$:     PRINTC                  ;SEND 0
24300 010504  005301                    DEC     R1              ;DECREMENT COLUMN COUNTER
24400 010506  001375                    BNE     2$              ;BRANCH IF NOT ZERO
24500 010510  012700  000062            MOV     #62,R0          ;SEND A 2
24600 010514  104015                    PRINTC
24700 010516  104015                    PRINTC                  ;SEND A SECOND TWO
24800 010520  026727  170126  000204    CMP     WIDTH,#132.     ;COMPARE COLUMN COUNT
24900 010526  001404                    BEQ     3$              ;BRANCH IF EQ 132
25000 010530  012700  003410            MOV     #3410,R0        ;DELAY 1.8 SEC
25100 010534  104010                    DELAY
25200 010536  000407                    BR      5$
25300 010540  012700  000063      3$:   MOV     #63,R0          ;3'S TO R0
25400 010544  012701  000100            MOV     #100,R1         ;64 TO COUNTER
25500 010550  104015            4$:     PRINTC                  ;SEND CHARACTER
25600 010552  005301                    DEC     R1              ;DECREMENT COUNT
25700 010554  001375                    BNE     4$              ;BRANCH IF NOT ZERO
25800 010556  104012            5$:     CRLF                    ;SEND A CR,LF
25900 010560  016701  170066            MOV     WIDTH,R1        ;NO. COLUMNS TO R1
26000 010564  012700  000134      6$:   MOV     #134,R0         ;BACKSLASH TO R0
26100 010570  104015                    PRINTC                  ;SEND IT
26200 010572  104014                    LF                      ;PRINT LF
26300 010574  005301                    DEC     R1              ;DECREMENT COUNTER
26400 010576  001372                    BNE     6$              ;BRANCH IF NOT ZERO.
26500 010600  104022                    CR                      ;SEND CR
26600 010602  004767  000022            JSR     PC,PT5AL        ;SEND REF LINE #1
26700 010606  104012                    CRLF                    ;SEND A CR,LF
26800 010610  012700  001750            MOV     #1750,R0        ;DELAY 1 SEC
26900 010614  104010                    DELAY
27000 010616  004767  000006            JSR     PC,PT5AL        ;SEND A SECOND REF. LIN
27100 010622  104012                    CRLF                    ;SEND A CR,LF
27200 010624  104005                    CHAIN                   ;CHAIN TO NEXT TEST
27300 010626  000720                    BR      1$              ;REPEAT TEST
27400 010630  016701  170016    PT5AL:  MOV     WIDTH,R1        ;COLUMN COUNT TO R1
27500 010634  012700  000061            MOV     #61,R0          ;"1" TO R0
27600 010640  104015            1$:     PRINTC                  ;PRINT R0
27700 010642  005301                    DEC     R1              ;DECREMENT COUNTER
27800 010644  001407                    BEQ     2$              ;BRANCH IF=0
27900 010646  005200                    INC     R0              ;INCREMENT CHARACTER
28000 010650  020027  000071            CMP     R0,#71          ;COMP CHAR TO "9"
28100 010654  101771                    BLOS    1$              ;BRANCH IF LOWER OR SAME
28200 010656  012700  000060            MOV     #60,R0          ;RESET CHAR TO "0"
28300 010662  000766                    BR      1$              ;CONTINUE
28400 010664  000207            2$:     RTS     PC              ;FINISHED, RETURN TO CALLER
```

```
 28600                                  ;XXXXXXXXXX
 28700                                  ;PT6--  BACKSPACE TEST -- A REFERENCE LINE SUCH AS IN
 28800                                  ;       TEST PT5 IS PRINTED.  THE SECOND LINE CONSISTS
 28900                                  ;       OF PRINTING A BACKSLASH, BACKSPACE AND FORWARD
 29000                                  ;       SLASH COMBINATION OUT TO THE GIVEN COLUMN WIDTH.
 29100                                  ;       THIS LINE IS THEN FOLLOWED BY THE SAME TWO REFERENCE
 29200                                  ;       LINES AS PRINTED IN TEST PT5.
 29300                                  ;XXXXXXXXXX
 29400
 29500 010666  000006                   PT6:    6                       ;TEST NUMBER
 29600 010670  011054                           PT7                     ;NEXT TEST
 29700 010672  104016                           PRTHDR                  ;PRINT HEADER
 29800 010674  104007                           TYPEM                   ;PRINT COLUMN # MESG
 29900 010676  014127                           HDR0
 30000 010700  016701  167746             1$:   MOV     WIDTH,R1        ;COLUMN COUNT TO R1
 30100 010704  005741                           TST     -(R1)           ;DECREMENT BY 2
 30200 010706  012700  000060                   MOV     #60,R0          ;"0" TO R0
 30300 010712  104015                     2$:   PRINTC                  ;SEND 0
 30400 010714  005301                           DEC     R1              ;DECREMENT COLUMN COUNTER
 30500 010716  001375                           BNE     2$              ;BRANCH IF NOT ZERO
 30600 010720  012700  000062                   MOV     #62,R0          ;"2" TO R0
 30700 010724  104015                           PRINTC                  ;SEND A "2"
 30800 010726  104015                           PRINTC                  ;SEND A SECOND "2"
 30900 010730  026727  167716  000204          CMP     WIDTH,#132.     ;COMPARE COLUMN COUNT
 31000 010736  001404                           BEQ     3$
 31100 010740  012700  003410                   MOV     #3410,R0        ;DELAY 1.8 SEC
 31200 010744  104010                           DELAY
 31300 010746  000407                           BR      5$
 31400 010750  012700  000063             3$:   MOV     #63,R0          ;3'S TO R0
 31500 010754  012701  000100                   MOV     #100,R1         ;64 TO CHAR COUNT
 31600 010760  104015                     4$:   PRINTC                  ;SEND CHAR
 31700 010762  005301                           DEC     R1              ;DECREMENT CHAR COUNT
 31800 010764  001375                           BNE     4$              ;CONTINUE IF NOT DONE
 31900 010766  104012                     5$:   CRLF                    ;SEND A CR,LF
 32000 010770  016701  167656                   MOV     WIDTH,R1        ;COLUMN COUNT TO R1
 32100 010774  012700  000134             6$:   MOV     #134,R0         ;BACKSLASH TO R0
 32200 011000  104015                           PRINTC                  ;SEND IT
 32300 011002  012700  000010                   MOV     #10,R0          ;BACKSPACE TO R0
 32400 011006  104015                           PRINTC                  ;SEND IT
 32500 011010  012700  000057                   MOV     #57,R0          ;FORWORD SLASH TO R0
 32600 011014  104015                           PRINTC                  ;SEND IT
 32700 011016  005301                           DEC     R1              ;END OF PAPER
 32800 011020  001365                           BNE     6$              ;BRANCH IF NO
 32900 011022  104014                           LF                      ;SEND LF
 33000 011024  104022                           CR                      ;SEND CR
 33100 011026  004767  177576                   JSR     PC,PT5AL        ;SEND REF LINE #1
 33200 011032  104012                           CRLF                    ;SEND A CR,LF
 33300 011034  012700  001750                   MOV     #1750,R0        ;DELAY 1 SEC
 33400 011040  104010                           DELAY
 33500 011042  004767  177562                   JSR     PC,PT5AL        ;SEND SECOND REF LINE
 33600 011046  104012                           CRLF                    ;SEND A CR,LF
 33700 011050  104005                           CHAIN                   ;CHAIN TO NEXT TEST
 33800 011052  000712                           BR      1$              ;REPEAT TEST
```

```
34000                           ;XXXXXXXXXX
34100                           ;
34200                           ;PT7--  OVERPRINT TEST-- A ROW OF ALTERNATING M'S AND
34300                           ;       SPACES ARE PRINTED, OUT TO THE LAST COLUMN AND OVERPRINTED TWICE.
34400                           ;       A SECOND LINE OF ALTERNATING SPACES AND '@'S'' IS THEN
34500                           ;       SENT 3 TIMES AS THE FIRST LINE.  THIS IS FOLLOWED
34600                           ;       BY A THIRD AND FINAL LINE OF ALTERNATING '&'
34700                           ;       AND SPACES.
34800                           ;
34900                           ;XXXXXXXXXX
35000
35100 011054  000007            PT7:    7                       ;TEST NUMBER
35200 011056  011266                    PT10                    ;NEXT TEST
35300 011060  104016                    PRTHDR                  ;PRINT MESSAGE
35400 011062  012703  000002    1$:     MOV     #2,R3           ;2 COUNT TO R3
35500 011066  016701  167560    2$:     MOV     WIDTH,R1        ;NO. OF COLUMNS TO R1
35600 011072  012700  000115    3$:     MOV     #115,R0         ;'M' TO R0
35700 011076  104015                    PRINTC                  ;SEND IT
35800 011100  005301                    DEC     R1              ;END OF LINE
35900 011102  001404                    BEQ     4$              ;BRANCH IF YES
36000 011104  004767  176450            JSR     PC,SPC          ;SEND SPACE
36100 011110  005301                    DEC     R1              ;END OF LINE?
36200 011112  001367                    BNE     3$              ;BRANCH IF NO
36300 011114  022703  000002    4$:     CMP     #2,R3           ;TEST R3
36400 011120  001003                    BNE     6$              ;BRANCH IF NOT FIRST TIME
36500 011122  104022            5$:     CR                      ;SEND CR
36600 011124  005303                    DEC     R3              ;DECREASE LINE COUNTER
36700 011126  000757                    BR      2$              ;REPEAT LINE
36800 011130  005703            6$:     TST     R3              ;THIRD TIME?
36900 011132  001373                    BNE     5$              ;BRANCH IF NOT
37000 011134  104012                    CRLF                    ;NEXT LINE
37100 011136  005723                    TST     (R3)+           ;REPEAT COUNTER TO R3
37200 011140  016701  167506    7$:     MOV     WIDTH,R1        ;COLUMN COUNT TO R1
37300 011144  004767  176410    8$:     JSR     PC,SPC          ;SEND SPACE
37400 011150  005301                    DEC     R1              ;DECREASE COLUMN COUNT
37500 011152  001405                    BEQ     9$              ;BRANCH IF 0, END OF LINE
37600 011154  012700  000100            MOV     #100,R0         ;'@'' TO R0
37700 011160  104015                    PRINTC                  ;SEND IT
37800 011162  005301                    DEC     R1              ;DECREASE COLUMN COUNT
37900 011164  001367                    BNE     8$              ;BRANCH IF NOT 0 (NOT END)
38000 011166  022703  000002    9$:     CMP     #2,R3           ;END OF LINE, FIRST TIME?
38100 011172  001003                    BNE     11$             ;BRANCH IF NOT
38200 011174  104022            10$:    CR                      ;SEND CR
38300 011176  005303                    DEC     R3              ;DECREASE LINE COUNTER
38400 011200  000757                    BR      7$              ;REPEAT LINE
38500 011202  005703            11$:    TST     R3              ;TEST IF THIRD REPEAT
38600 011204  001373                    BNE     10$             ;BRANCH IF NOT
38700 011206  104012                    CRLF                    ;DO NEXT LINE
38800 011210  005723                    TST     (R3)+           ;LINE REPEAT COUNTER TO R3
38900 011212  016701  167434    12$:    MOV     WIDTH,R1        ;COLUMN COUNT TO R1
39000 011216  012700  000046    13$:    MOV     #46,R0          ;'&'' TO R0
39100 011222  104015                    PRINTC                  ;SEND IT
39200 011224  005301                    DEC     R1              ;DECREASE COLUMN COUNT
39300
39400 011226  001404                    BEQ     14$             ;BRANCH IF END
39500 011230  004767  176324            JSR     PC,SPC          ;SEND SPACE
39600 011234  005301                    DEC     R1              ;DECREASE COLUMN COUNT
```

```
 39700 011236  001367                    BNE     13$             ;BRANCH IF NOT END
 39800 011240  022703  000002      14$:   CMP     #2,R3           ;TEST IF FIRST TIME
 39900 011244  001003                    BNE     16$             ;BRANCH IF =2, FIRST TIME
 40000 011246  104022              15$:  CR                      ;SENT CR
 40100 011250  005303                    DEC     R3              ;DECREASE REPEAT COUNTER
 40200 011252  000757                    BR      12$             ;PRINT LINE AGAIN
 40300 011254  005703              16$:  TST     R3              ;TEST IF END, R3=0
 40400 011256  001373                    BNE     15$             ;BRANCH IF NOT END
 40500 011260  104012                    CRLF                    ;SEND CR,LF
 40600 011262  104005                    CHAIN                   ;CHAIN TO NEXT TEST
 40700 011264  000676                    BR      1$              ;REPEAT TEST
```

```
                                        ;XXXXXXXXXX
                                        ;
                                        ;PT10-- PRINTING FREQUENCY TEST-- 120 H'S ARE PRINTED ON 4 LINES
                                        ;       30 PER LINE. THE TEST IS SUCH THAT BETWEEN THE FIRST AND SECOND
                                        ;       'H' A 30 MSEC DELAY IS INTRODUCED. THIS DELAY IS THEN INCREASED
                                        ;       BETWEEN CHARACTERS OUT TO 60 CHARACTERS IN AN EXPONENTIAL
                                        ;       MANNER. THE DELAY IS THEN DECREASED IN THE SAME MANNER OUT TO THE
                                        ;       120TH CHARACTER. THIS DELAY IS CALCULATED AS FOLLOWS;
                                        ;
                                        ;               NEW DELAY = OLD DELAY [+ OR -] (OLD DELAY/16 + OLD DELAY/128 )
                                        ;
                                        ;XXXXXXXXXX
011266  000010                  PT10:   10                      ;TEST NUMBER
011270  011424                          PT11                    ;NEXT TEST
011272  104016                          PRTHDR                  ;TYPE MESSAGE
011274  012701  000036          1$:     MOV     #36,R1          ;SET R1=30
011300  012702  000170                  MOV     #120.,R2        ;SET CHAR COUNT = 120
011304  012767  000036  000010          MOV     #30.,3$+2       ;SET UP DELAY VALUE
011312  012700  000110          2$:     MOV     #110,R0         ;'H' TO R0
011316  104015                          PRINTC                  ;SEND IT
011320  012700  000036          3$:     MOV     #30.,R0
011324  104010                          DELAY                   ;DELAY
011326  005301                          DEC     R1              ;DEC. COUNT OF CHARS PER LINE
011330  001426                          BEQ     6$              ;BRANCH IF 0, END OF LINE
011332  005302                  4$:     DEC     R2              ;DECREMENT CHAR COUNTER
011334  001430                          BEQ     7$              ;BRANCH IF END
011336  016704  177760                  MOV     3$+2,R4         ;GET OLD DELAY
011342  006204                          ASR     R4              ;CAL 1/16 OF OLD DELAY
011344  006204                          ASR     R4
011346  006204                          ASR     R4
011350  006204                          ASR     R4
011352  010405                          MOV     R4,R5           ;SAVE 1/16 IN R5
011354  006204                          ASR     R4              ;CAL 1/128 OF OLD DELAY
011356  006204                          ASR     R4
011360  006204                          ASR     R4
011362  060405                          ADD     R4,R5           ;1/16 +1/128 TO R5
011364  022702  000074                  CMP     #60.,R2         ;TEST WHICH HALF OF THE 120 CHARS.
011370  003403                          BLE     5$              ;BRANCH IF LT OR EQ 60
011372  160567  177724                  SUB     R5,3$+2         ;GT 51, DECREASE DELAY BY 34 MEC.
011376  000745                          BR      2$              ;GO PRINT AGAIN
011400  060567  177716          5$:     ADD     R5,3$+2         ;LT HALF WAY, ADD DELAY OF 34 MEC.
011404  000742                          BR      2$              ;GO PRINT AGAIN
011406  104012                  6$:     CRLF                    ;SEND CRLF
011410  012701  000036                  MOV     #36,R1          ;SET R1=30
011414  000746                          BR      4$
011416  104012                  7$:     CRLF                    ;SEND CR,LF
011420  104005                          CHAIN                   ;CHAIN TO NEXT TEST
011422  000724                          BR      1$              ;REPEAT TEST
```

```
                                ;XXXXXXXXXX
                                ;
                                ;PT11-- RIBBON FEED TEST-- THIS TEST PRINTS A SINGLE COLUMN OF X'S
                                ;       (24 LINES) DOWN THE LEFT MARGIN OF THE PAGE.
                                ;       VISUALLY CHECK THE RIBBON FEED MECHANISM FOR PROPER OPERATION.
                                ;
                                ;XXXXXXXXXX

011424  000011                  PT11:   11                      ;TEST NUMBER
011426  011456                          PT12                    ;NEXT TEST
011430  104016                          PRTHDR                  ;TYPE MESSAGE
011432  012701  000030          1$:     MOV     #30,R1          ;SET R1=24(10), LINE COUNT
011436  012700  000130          2$:     MOV     #130,R0         ;SET CHAR = X
011442  104015                          PRINTC                  ;PRINT X
011444  104012                          CRLF                    ;SEND CR-LF
011446  005301                          DEC     R1              ;DECREMENT LINE COUNT
011450  001372                          BNE     2$              ;CONTINUE IF NOT DONE TEST
011452  104005                          CHAIN                   ;CHAIN TO NEXT TEST
011454  000766                          BR      1$              ;REPEAT TEST


                                ;XXXXXXXXXX
                                ;
                                ;PT12-- PRINTER BELL TEST-- THE LAST TEST IN THE
                                ;       PRINTER TEST SEQUENCE.  THIS TEST OUTPUTS
                                ;       EIGHT BELL SIGNALS TO THE PRINTER
                                ;
                                ;
                                ;XXXXXXXXXX
                                ;
011456  000012                  PT12:   12                      ;THIS TEST
011460  007372                          PT0                     ;NEXT TEST
011462  104016                          PRTHDR                  ;TYPE HEADER
011464  012701  000010          PT12A:  MOV     #10,R1          ;COUNTER TO R1
011470  012700  000007                  MOV     #7,R0           ;BELL TO R0
011474  104015                  1$:     PRINTC                  ;SEND IT
011476  005301                          DEC     R1              ;DECREMENT COUNT
011500  001375                          BNE     1$              ;BRANCH IF NOT ZERO
011502  104014                          LF
011504  012700  003720                  MOV     #3720,R0        ;DELAY 2 SEC BEFORE RESTARTING
011510  104010                          DELAY
011512  013700  000042                  MOV     @#42,R0         ;CHECK IF UNDER ACT11 OR XXDP
011516  001405                          BEQ     HERE            ;CONTINUE TEST SEQUENCE
011520  000240                          NOP                     ;A RESET WAS FORMERLY HERE
011522  004710                  LOGICAL:JSR     PC,(R0)
011524  000240                          NOP
011526  000240                          NOP
011530  000240                          NOP
011532  104005                  HERE:   CHAIN                   ;CHAIN TO NEXT TEST
011534  000753                          BR      PT12A           ;REPEAT TEST
```

```
                                ;XXXXXXXXXX
                                ;
                                ;PT17-- LIFE TEST
                                ;       THIS TEST PRINTS 2 FULL LINES OF EACH PRINTABLE
                                ;       CHARACTER AND OVERPRINTS THE SECOND LINE 4 TIMES.
                                ;       THIS TEST IS CONTINUOUS RUNNING ONCE INITIATED,
                                ;       LOOPING AUTOMATICALLY ON ITSELF.
                                ;       END OF PASS COUNT IS CLEARED WHENEVER TEST IS RESTARTED
                                ;
                                ;XXXXXXXXXX

011536  000017          PT17B:  17                      ;TEST NUMBER
011540  011536                  PT17B                   ;NEXT TEST
011542  000167  000030          JMP     PT17D           ;CONTINUE
011546  000017          PT17:   17                      ;TEST NUMBER
011550  011536                  PT17B                   ;NEXT TEST
011552  005067  000336          CLR     PASCNT          ;CLEAR PASS COUNT
011556  016704  167070          MOV     WIDTH,R4        ;INITIALIZE R4
011562  012767  000001  000322  MOV     #1,DIRTN        ;AND DIRECTION OF PRECESS
011570  104016                  PRTHDR
011572  104007                  TYPEM                   ;PRINT COLUMN # MESG
011574  014127                  HDR0
011576  012703  000041  PT17D:  MOV     #41,R3          ;SET START CHAR
011602  005267  000306          INC     PASCNT
011606  026727  000302  000031  CMP     PASCNT,#31      ;DO 31 TIMES
011614  001003                  BNE     20$             ;BRANCH IF NOT DONE
011616  012767  000001  000270  MOV     #1,PASCNT       ;START OVER
011624  012700  014042  20$:    MOV     #PASMES,R0      ;SET MESG ADDR
011630  016701  000260          MOV     PASCNT,R1       ;# TO CONVERT
011634  012702  000002          MOV     #2,R2           ;# DIGITS
011640  104023                  BTOASC                  ;CONVERT PASCNT TO ASCII
011642  016701  167004  1$:     MOV     WIDTH,R1        ;SET COLUMN COUNT
011646  010300          2$:     MOV     R3,R0           ;GET CHARACTER
011650  004767  000110          JSR     PC,CKPOS        ;TIME TO INSERT PASS # ?
011654  104015                  PRINTC                  ;SEND CHAR
011656  005301                  DEC     R1              ;DECREMENT COUNT
011660  003372                  BGT     2$              ;BRANCH IF NOT DONE
011662  004767  000144          JSR     PC,ADJR4        ;ADJUST R4 POINTER
011666  104012                  CRLF
011670  012702  000005          MOV     #5,R2           ;SET OVERPRINT COUNT
011674  016701  166752  3$:     MOV     WIDTH,R1        ;SET COLUMN COUNT
011700  010300          4$:     MOV     R3,R0           ;GET CHARACTER
011702  004767  000056          JSR     PC,CKPOS        ;TIME TO INSERT PASS # ?
011706  104015                  PRINTC                  ;SEND CHAR
011710  005301                  DEC     R1              ;DECREMENT COUNT
011712  003372                  BGT     4$              ;BRANCH IF NOT DONE
011714  104022                  CR                      ;SEND CR
011716  005302                  DEC     R2              ;DONE OVERPRINTS ?
011720  001365                  BNE     3$              ;NO. CONTINUE
011722  004767  000104          JSR     PC,ADJR4        ;ADJUST R4 POINTER
011726  104014                  LF                      ;SEND LF
011730  005203                  INC     R3              ;SET NEXT CHAR
011732  022703  000177          CMP     #177,R3         ;DONE CHAR SET ?
011736  001341                  BNE     1$              ;NO. CONTINUE
011740  004767  000066          JSR     PC,ADJR4        ;OFFSET POINTER 3 PLACES
011744  004767  000062          JSR     PC,ADJR4        ;TO RETAIN VISUAL ALIGNMENT
011750  004767  000056          JSR     PC,ADJR4        ;THROUGH END OF PASS
```

```
 56900 011754  104007                TYPEM                   ;TYPE END OF PASS MESG
 57000 011756  014023                ENDPAS
 57100 011760  104005                CHAIN                   ;REPEAT TEST
 57200 011762  000705                BR      PT17D
 57300
```

```
 57500
 57600 011764  020401                CKPOS:  CMP     R4,R1           ;IS IT TIME TO INSERT PASS # ?
 57700 011766  001020                        BNE     1$              ;BRANCH IF NO
 57800 011770  012700  000040                MOV     #40,R0          ;PRINT A SPACE
 57900 011774  104015                        PRINTC
 58000 011776  116700  002040                MOVB    PASMES,R0       ;PRINT MSG OF PASS COUNT
 58100 012002  104015                        PRINTC
 58200 012004  116700  002033                MOVB    PASMES+1,R0
 58300 012010  104015                        PRINTC
 58400 012012  012700  000040                MOV     #40,R0          ;PRINT A SPACE
 58500 012016  104015                        PRINTC
 58600 012020  162701  000003                SUB     #3,R1           ;ADJUST R1 3 POSITIONS
 58700 012024  062716  000002                ADD     #2,(SP)         ;ADJUST RETURN PC OVER PRINTC
 58800 012030  000207                1$:     RTS     PC
 58900
 59000 012032  005767  000054          ADJR4:  TST     DIRTN           ;TEST DIRECTION OF PRECESS
 59100 012036  001013                        BNE     1$              ;BR IF LEFT
 59200 012040  005204                        INC     R4              ;INCREASE POSITION CNTR
 59300 012042  020467  166604                CMP     R4,WIDTH        ;IS R4 > WIDTH ?
 59400 012046  101420                        BLOS    3$              ;BR IF NOT GREATER
 59500 012050  016704  166576                MOV     WIDTH,R4        ;CHANGE DIRECTION
 59600 012054  005304                        DEC     R4              ;       TO
 59700 012056  012767  000001  000026        MOV     #1,DIRTN        ;     LEFT.
 59800 012064  000411                        BR      3$
 59900 012066  005304                1$:     DEC     R4              ;DECREASE POSITION CNTR
 60000 012070  020427  000004                CMP     R4,#4   ;LESS THAN 4 ?
 60100 012074  002401                        BLT     2$              ;BR IF YES
 60200 012076  000404                        BR      3$              ;ELSE EXIT
 60300 012100  012704  000005          2$:   MOV     #5,R4           ;SET R4 TO POS 5
 60400 012104  005067  000002                CLR     DIRTN           ;CHANGE DIRECTION TO RIGHT
 60500 012110  000207                3$:     RTS     PC              ;EXIT
 60600
 60700 012112  000000          DIRTN:  .WORD   0               ;DIRECTION OF PRECESS (0=LEFT)
 60800
 60900 012114  000000          PASCNT: .WORD   0
```

```
61100
```

```
                                        .SBTTL  LA36 ECHO TESTS
                                ;
                                ;XXXXXXXXXX
                                ;
                                ;EO20-- CHARACTER ECHO TEST-- ALL PRINTABLE AND
                                ;       NON-PRINTING CHARACTERS TYPED ON THE KEYBOARD
                                ;       ARE USED TO DRIVE THE PRINTER, ONE CHARACTER AT
                                ;       A TIME.  A 'RUBOUT' WILL CAUSE THE TEST TO BE
                                ;       TERMINATED.
                                ;
                                ;XXXXXXXXXX
                                ;
012116  000020                  EO20:   20                      ;TEST NUMBER
012120  012166                          EO21                    ;NEXT TEST
012122  104016                          PRTHDR                  ;TYPE HEADER
012124  104020                  1$:     READ                    ;GO WAIT FOR KEYBOARD INPUT
012126  012700  000036                  MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
012132  104010                          DELAY
012134  022767  000177  166536          CMP     #177,TEMPCH     ;CHECK IF RUBOUT
012142  001405                          BEQ     2$              ;BRANCH IF YES
012144  104017                          PRNT                    ;NO, CHECK PRINTER READY
012146  117777  166442  166444          MOVB    @TKB,@TPB       ;READY, ECHO CHARACTER
012154  000763                          BR      1$
012156  104007                  2$:     TYPEM                   ;PRINT TERMINATION MESSAGE
012160  014272                          ECOEND
012162  104005                          CHAIN                   ;CHAIN TO NEXT TEST
012164  000757                          BR      1$              ;REPEAT TEST
                                ;
                                ;XXXXXXXXXX
                                ;
                                ;EO21-- LINE ECHO TEST, FAST RATE-- THIS TEST WILL
                                ;       CAUSE THE CONTINUAL PRINTING OF '0' AT THE MAXIMUM
                                ;       RATE UNTIL EITHER ANOTHER CHARACTER IS SELECTED
                                ;       BY PRESSING A KEY ON THE KEYBOARD OR TERMINATION BY THE
                                ;       RUBOUT.
                                ;
                                ;XXXXXXXXXX
                                ;
012166  000021                  EO21:   21                      ;TEST NUMBER
012170  012224                          EO22                    ;NEXT TEST
012172  104016                          PRTHDR                  ;TYPE HEADER
012174  012767  000060  166460  EO21A:  MOV     #60,REPT        ;CHARACTER TO BE REPEATED (0)
012202  016702  166444          1$:     MOV     WIDTH,R2        ;SET COLUMN COUNT
012206  016700  166450          2$:     MOV     REPT,R0         ;GET CHAR
012212  104015                          PRINTC                  ;PRINT CHAR
012214  005302                          DEC     R2              ;DEC COLUMN COUNT
012216  003373                          BGT     2$              ;FINISH LINE
012220  104012                          CRLF                    ;SEND A CR AND LF
012222  000767                          BR      1$
```

```
 5100                                   ;XXXXXXXXXX
 5200                                   ;
 5300                                   ;EO22-- LINE ECHO TEST, SLOW RATE-- SAME AS EO21 EXCEPT
 5400                                   ;       THAT A DELAY IS INTRODUCED BETWEEN CHARACTERS
 5500                                   ;       TO PRODUCE A LCV ACTION
 5600                                   ;
 5700                                   ;XXXXXXXXXX
 5800                                   ;
 5900 012224  000022                    EO22:   22
 6000 012226  012476                            EO23
 6100 012230  104016                            PRTHDR                  ;TYPE HEADER
 6200 012232  012767  000060  166422    EO22A:  MOV     #60,REPT        ;LOAD 0 AS INITIAL CHARACTER
 6300 012240  016702  166406            1$:     MOV     WIDTH,R2        ;SET COLUMN COUNT
 6400 012244  016700  166412            2$:     MOV     REPT,R0         ;GET CHAR
 6500 012250  104015                            PRINTC                  ;PRINT CHAR
 6600 012252  005302                            DEC     R2              ;DEC COLUMN COUNT
 6700 012254  001404                            BEQ     3$              ;BRANCH IF DONE LINE
 6800 012256  012700  003410                    MOV     #3410,R0
 6900 012262  104010                            DELAY                   ;DELAY 1.8 SEC.
 7000 012264  000767                            BR      2$              ;OUTPUT NEW CHAR.
 7100 012266  104012                    3$:     CRLF                    ;SEND A CR AND LF
 7200 012270  000763                            BR      1$
```

```
 7400                                   ;**********
 7500                                   ;
 7600                                   ;       THIS FOLLOWING TABLE IS USED BY TEST E023
 7700                                   ;
 7800                                   ;**********
 7900
 8000 012272  116   125   114  MONIC:  .ASCII  /NUL /
      012275  040
 8100 012276  123   117   110          .ASCII  /SOH /
      012301  040
 8200 012302  123   124   130          .ASCII  /STX /
      012305  040
 8300 012306  105   124   130          .ASCII  /ETX /
      012311  040
 8400 012312  105   117   124          .ASCII  /EOT /
      012315  040
 8500 012316  105   116   121          .ASCII  /ENQ /
      012321  040
 8600 012322  101   103   113          .ASCII  /ACK /
      012325  040
 8700 012326  102   105   114          .ASCII  /BEL /
      012331  040
 8800 012332  102   123   040          .ASCII  /BS  /
      012335  040
 8900 012336  110   124   040          .ASCII  /HT  /
      012341  040
 9000 012342  114   106   040          .ASCII  /LF  /
      012345  040
 9100 012346  126   124   040          .ASCII  /VT  /
      012351  040
 9200 012352  106   106   040          .ASCII  /FF  /
      012355  040
 9300 012356  103   122   040          .ASCII  /CR  /
      012361  040
 9400 012362  123   117   040          .ASCII  /SO  /
      012365  040
 9500 012366  123   111   040          .ASCII  /SI  /
      012371  040
 9600 012372  104   114   105          .ASCII  /DLE /
      012375  040
 9700 012376  104   103   061          .ASCII  /DC1 /
      012401  040
 9800 012402  104   103   062          .ASCII  /DC2 /
      012405  040
 9900 012406  104   103   063          .ASCII  /DC3 /
      012411  040
10000 012412  104   103   064          .ASCII  /DC4 /
      012415  040
10100 012416  116   101   113          .ASCII  /NAK /
      012421  040
10200 012422  123   131   116          .ASCII  /SYN /
      012425  040
10300 012426  105   124   102          .ASCII  /ETB /
      012431  040
10400 012432  103   101   116          .ASCII  /CAN /
      012435  040
10500 012436  105   115   040          .ASCII  /EM  /
```

```
                012441  040
10600           012442  123     125     102             .ASCII  /SUB /
                012445  040
10700           012446  105     123     103             .ASCII  /ESC /
                012451  040
10800           012452  106     123     040             .ASCII  /FS  /
                012455  040
10900           012456  107     123     040             .ASCII  /GS  /
                012461  040
11000           012462  122     123     040             .ASCII  /RS  /
                012465  040
11100           012466  125     123     040             .ASCII  /US  /
                012471  040
11200           012472  123     120     040             .ASCII  /SP  /
                012475  040
11300
11400                                                   .EVEN
```

```
                                        ;XXXXXXXXXX
                                        ;
                                        ;EO23-- CHARACTER CODE TEST-- ANY CHARACTER SELECTED
                                        ;       WILL BE ECHOED ALONG WITH ITS OCTAL CODE.
                                        ;       A MNEMONIC WILL BE PRINTED INSTEAD OF THE CHARACTER
                                        ;       IF IT IS A NON-PRINTING CHARACTER.
                                        ;       THE PARITY OF THE RECEIVED CODE WILL ALSO BE
                                        ;       INDICATED AS EITHER EVEN OR ODD.
                                        ;
                                        ;XXXXXXXXXX
                                        ;
012476  000023                  EO23:   23                      ;TEST NUMBER
012500  013020                          EO24                    ;NEXT TEST
012502  104016                          PRTHDR                  ;TYPE HEADER
012504  104020                  1$:     READ                    ;GO WAIT FOR CHARACTER
012506  012700  000036                  MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
012512  104010                          DELAY
012514  026727  166160  000041          CMP     TEMPCH,#41      ;TEST IF CHAR IS PRINTABLE
012522  103015                          BHIS    3$              ;BRANCH IF IT IS
012524  004767  000130                  JSR     PC,STRLN        ;STORE CODE INTO MESSAGE
012530  116700  166144                  MOVB    TEMPCH,R0       ;GET CODE AGAIN
012534  006300                          ASL     R0              ;MULT BY 2
012536  006300                          ASL     R0              ;MULT BY 4
012540  062700  012272                  ADD     #MONIC,R0       ;ADD ADDR OF MNEMONIC TABLE
012544  004767  000166                  JSR     PC,MOVNUM       ;MOV MNEMONIC TO MESSAGE
012550  104000                  2$:     TYPE                    ;TYPE CODE AND MNEMONIC
012552  014321                          EO23M                   ;ADDRESS OF MESSAGE
012554  000753                          BR      1$              ;GO WAIT FOR NEXT CHARACTER
012556  026727  166116  000177  3$:     CMP     TEMPCH,#177     ;TEST IF CHAR IS A RUBOUT
012564  001421                          BEQ     4$              ;BRANCH IF RUBOUT
012566  012701  013010                  MOV     #MG24,R1
012572  116721  166102                  MOVB    TEMPCH,(R1)+
012576  112721  000040                  MOVB    #40,(R1)+
012602  112721  000040                  MOVB    #40,(R1)+
012606  112721  000040                  MOVB    #40,(R1)+
012612  004767  000042                  JSR     PC,STRLN        ;STORE CODE INTO MESSAGE
012616  012700  013010                  MOV     #MG24,R0        ;ADDR OF CHAR INTO R0
012622  004767  000110                  JSR     PC,MOVNUM       ;MOVE CHAR INTO MESSAGE
012626  000750                          BR      2$              ;TYPE MESSAGE
012630  004767  000024          4$:     JSR     PC,STRLN        ;RUBOUT, CONVERT AND STOR CODE
012634  012700  013014                  MOV     #MG25,R0        ;ADDR. OF DEL INTO R0
012640  004767  000072                  JSR     PC,MOVNUM       ;MOVE DEL INTO MESSAGE
012644  104000                          TYPE                    ;TYPE MESSAGE
012646  014321                          EO23M                   ;ADDR OF MESSAGE
012650  104007                          TYPEM
012652  014272                          ECOEND
012654  104005                          CHAIN                   ;CHAIN TO NEXT TEST
012656  000712                          BR      1$              ;REPEAT TEST
012660  012702  000003          STRLN:  MOV     #3,R2           ;COUNT OF 3 TO R2
012664  012701  014323                  MOV     #LINE5,R1       ;ADDR OF MESG TO R1
012670  062701  000003                  ADD     #3,R1           ;POINT TO LAST SPACE IN MESG
012674  016700  166004          1$:     MOV     PCHAR,R0        ;MOVE OCTAL CODE TO R0
012700  042700  177770                  BIC     #177770,R0      ;SAVE LS OCTAL CHAR
012704  062700  000060                  ADD     #60,R0          ;MAKE ASCII
012710  110041                          MOVB    R0,-(R1)        ;MOVE INTO MESG
012712  005302                          DEC     R2              ;DECREMENT CHAR COUNTER
012714  001407                          BEQ     2$              ;BRANCH IF 3 MOVED
```

```
 17300 012716  006267  165762                ASR     PCHAR           ;NOT THREE, SHIFT NEXT OCTAL
 17400 012722  006267  165756                ASR     PCHAR           ;CHARACTER TO THE RIGHT
 17500 012726  006267  165752                ASR     PCHAR           ;
 17600 012732  000760                        BR      1$              ;CONVERT AND STORE NEXT CHAR
 17700 012734  000207                2$:     RTS     PC              ;RETURN TO CALLER
 17800 012736  012701  014327        MOVNUM: MOV     #LINE5A,R1      ;ADDR OF LINES IN R1
 17900 012742  012702  000004                MOV     #4,R2           ;COUNT OF 4 TO R2
 18000 012746  112021                1$:     MOVB    (R0)+,(R1)+     ;MOV 4 CHARS TO MESG AREA
 18100 012750  005302                        DEC     R2              ;DECREMENT COUNTER
 18200 012752  001375                        BNE     1$              ;BRANCH IF NOT ALL DONE
 18300 012754  105767  165722                TSTB    PARITY          ;TEST PARITY FLAG
 18400 012760  001003                        BNE     2$              ;BRANCH IF ODD PARITY
 18500 012762  012700  014371                MOV     #EVEN,R0        ;SET ADDRESS FOR EVEN PARITY MESG
 18600 012766  000402                        BR      3$              ;CONTINUE
 18700 012770  012700  014375        2$:     MOV     #ODD,R0         ;SET ADDRESS FOR ODD PARITY MESG
 18800 012774  012702  000004        3$:     MOV     #4,R2           ;COUNT OF 4 TO R2
 18900 013000  112021                4$:     MOVB    (R0)+,(R1)+     ;MOVE 4 CHARS TO MESG AREA
 19000 013002  005302                        DEC     R2              ;DECREMENT COUNTER
 19100 013004  001375                        BNE     4$              ;BRANCH IF NOT DONE
 19200 013006  000207                        RTS     PC              ;RETURN
 19300
 19400 013010    040     040     040 MG24:   .ASCII  /   /           ;SAVE CHARACTER CODE
       013013    040
 19500
 19600                                       .EVEN
 19700
 19800 013014    104     105     114 MG25:   .ASCII  /DEL /          ;MNEMONIC FOR RUBOUT
       013017    040
 19900
 20000                                       .EVEN
```

```
 20200                                  ;XXXXXXXXXX
 20300                                  ;EO24-- SELECTED PATTERN ECHO TEST-- SELECT 1 TO 256
 20400                                  ;       CHARACTERS.  EACH WILL BE ECHOED
 20500                                  ;       AND STORED UNTIL THE CNTL/C IS SELECTED.
 20600                                  ;       AT THAT TIME ALL CHARACTERS WILL BE PRINTED AS
 20700                                  ;       A CONTINOUS STRING UNTIL EITHER THE RUBOUT IS
 20800                                  ;       SELECTED TO TERMINATE OR THE CNTL/C IS SELECTED
 20900                                  ;       AGAIN.  A TERMINATING CNTL/C FOLLOWED BY ANOTHER
 21000                                  ;       CNTL/C WILL ALWAYS CAUSE THE LAST INPUTTED STRING TO
 21100                                  ;       BE PRINTED.  A TERMINATING CNTL/C FOLLOWED BY A CHARACTER OTHER THAN A
 21200                                  ;       RUBOUT WILL CAUSE A NEW STRING TO BE INPUTTED.
 21300                                  ;XXXXXXXXXX
 21400
 21500 013020  000024                   EO24:   24                      ;TEST NUMBER
 21600 013022  013566                           EO25                    ;NEXT TEST
 21700 013024  104016                           PRTHDR                  ;TYPE TEST HEADER
 21800 013026  005001                   EO24B:  CLR     R1              ;CLEAR CHARACTER COUNT
 21900 013030  012702  013164                    MOV     #BUFR,R2        ;ADDRESS OF BUFFER TO R2
 22000 013034  104020                   1$:     READ                    ;WAIT FOR INPUT
 22100 013036  012700  000036                    MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
 22200 013042  104010                           DELAY
 22300 013044  022767  000177  165626            CMP     #177,TEMPCH     ;TEST IF RUBOUT
 22400 013052  001440                           BEQ     TERM            ;BRANCH IF RUBOUT
 22500 013054  022767  000003  165616            CMP     #3,TEMPCH       ;TEST IF CNTL-C
 22600 013062  001413                           BEQ     OUTPUT          ;BRANCH IF CNTL-C
 22700 013064  020127  000400                    CMP     R1,#256.        ;YES, CHECK IF CHAR CNT IS EQ, GT 256
 22800 013070  103361                           BHIS    1$              ;BRANCH IF YES, IGNORE CHAR
 22900 013072  116722  165602                    MOVB    TEMPCH,(R2)+    ;STORE CHAR INTO BUFFER
 23000 013076  005201                           INC     R1              ;INCREMENT CHARACTER COUNT
 23100 013100  104017                           PRNT                    ;CHECK IF PRINTER READY
 23200 013102  116777  165572  165510          MOVB    TEMPCH,@TPB     ;ECHO CHAR
 23300 013110  000751                           BR      1$              ;GO WAIT FOR NEXT CHAR
 23400                                  ;
 23500                                  ;SECTION TO OUTPUT CONTINOUS STRING
 23600                                  ;
 23700 013112  020227  013164           OUTPUT: CMP     R2,#BUFR        ;CHECK IF POINTER IS AT START OF TABLE
 23800 013116  001403                           BEQ     1$              ;YES, BRANCH
 23900 013120  116722  165554                    MOVB    TEMPCH,(R2)+    ;NO, STORE ^C IN TABLE
 24000 013124  104013                           SCRLF                   ;SEND A CR LF
 24100 013126  012702  013164           1$:     MOV     #BUFR,R2        ;BUFFER ADDRESS TO R2
 24200 013132  021227  000003                    CMP     (R2),#3         ;CHECK IF FIRST CHAR IS ^C
 24300 013136  001733                           BEQ     EO24B           ;YES, LOOK FOR INPUT AGAIN
 24400 013140  112200                   2$:     MOVB    (R2)+,R0        ;GET CHARACTER
 24500 013142  020027  000003                    CMP     R0,#3           ;DONE STRING?
 24600 013146  001767                           BEQ     1$              ;YES, RESTART STRING
 24700 013150  104015                           PRINTC                  ;PRINT CHAR
 24800 013152  000772                           BR      2$              ;CONTINUE
 24900 013154  104007                   TERM:   TYPEM                   ;OUTPUT TERMINATION MESSAGE
 25000 013156  014272                           ECOEND
 25100 013160  104005                           CHAIN                   ;CHAIN TO NEXT TEST
 25200 013162  000721                           BR      EO24B           ;REPEAT TEST
 25300 013164  000003                   BUFR:   3                       ;INITIALIZE FIRST CHAR AS CNTL-C IN TABLE
 25400 013166                                   .BLKB   256.            ;256 CHARACTER BUFFER
```

```
25600                                   ;XXXXXXXXXXX
25700                                   ;
25800                                   ;EO25-- BELL ECHO TEST-- A MESSAGE IS PRINTED AND
25900                                   ;       THE TEST WAITS FOR SOME PRINTABLE CHARACTER
26000                                   ;       TO BE SELECTED ON THE KEYBOARD (GT040).  THIS
26100                                   ;       TEST IS VALID ONLY IF THE PAPER WIDTH IS GT 64
26200                                   ;       COLUMNS.  IF LT64 COLUMNS AN ILLEGAL BELL TEST
26300                                   ;       MESSAGE IS PRINTED.
26400                                   ;
26500                                   ;XXXXXXXXXXX
26600                                   ;
26700 013566  000025                    EO25:   25                      ;TEST NUMBER
26800 013570  012116                            EO20                    ;NEXT TEST HEADER
26900 013572  104016                            PRTHDR                  ;PRINT HEADER
27000 013574  026727  165052  000101    1$:     CMP     WIDTH,#101      ;TEST IF COLUMN COUNTIS EQ,GT 64
27100 013602  103427                            BLO     4$              ;BRANCH IF NOT
27200 013604  104007                            TYPEM                   ;TYPE TEST MESG
27300 013606  014145                            EO25MA
27400 013610  000402                            BR      3$              ;WAIT FOR CHAR
27500 013612  104000                    2$:     TYPE                    ;TYPE TEST MESG ON TERM CHAR RCVD ON
27600 013614  014145                            EO25MA
27700 013616  104020                    3$:     READ                    ;WAIT FOR OPERATOR RESPONSE
27800 013620  012700  000036                    MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
27900 013624  104010                            DELAY
28000 013626  026727  165046  000040            CMP     TEMPCH,#40      ;TEST IF PRINTABLE
28100 013634  103770                            BLO     3$              ;BRANCH IF NON-PRINTABLE
28200 013636  022767  000177  165034            CMP     #177,TEMPCH     ;CHECK IF CHAR IS RUBOUT
28300 013644  001410                            BEQ     5$              ;BRANCH IF YES
28400 013646  104017                            PRNT                    ;CHECK IF PRINTER IS READY
28500 013650  116777  165024  164742            MOVB    TEMPCH,@TPB     ;PRINT CHAR. (BELL SHOULD SOUND)
28600 013656  104013                            SCRLF                   ;SEND A CRLF
28700 013660  000754                            BR      2$              ;REPEAT
28800 013662  104007                    4$:     TYPEM                   ;TYPE ERROR MESSAGE
28900 013664  014245                            EO25MB
29000 013666  104007                    5$:     TYPEM                   ;PRINT TERMINATION
29100 013670  014272                            ECOEND
29200 013672  104005                            CHAIN                   ;EXIT TO NEXT TEST
29300 013674  000737                            BR      1$              ;REPEAT TEST
```

```
29500
```

```
                                                .SBTTL  MISC. DIAGNOSTIC MESSAGES
                                                ;
013676  007     002     200     STARTM: .ASCII  <7><2><ACRLF><17>/CZLACE0 LA36 TERM (DL11 & KL11)/<ACRLF>
013701  017     103     132
013704  114     101     103
013707  105     060     040
013712  114     101     063
013715  066     040     124
013720  105     122     115
013723  040     050     104
013726  114     061     061
013731  040     046     040
013734  113     114     061
013737  061     051     200
013742  114     101     063             .ASCII  /LA36 TERMINAL DIAGNOSTIC/<ACRLF>
013745  066     040     124
013750  105     122     115
013753  111     116     101
013756  114     040     104
013761  111     101     107
013764  116     117     123
013767  124     111     103
013772  200
013773  104     114     061             .ASCIZ  /DL11 & KL11 INTERFACE/<ACRLF><12>
013776  061     040     046
014001  040     113     114
014004  061     061     040
014007  111     116     124
014012  105     122     106
014015  101     103     105
014020  200     012     000
014023  200     012     105     ENDPAS: .ASCII  <ACRLF><12>/END OF PASS  /
014026  116     104     040
014031  117     106     040
014034  120     101     123
014037  123     040     040
014042  060     060     060     PASMES: .ASCIZ  /0000/<ACRLF><12>
014045  060     200     012
014050  000
014051  200     103     117     DL11S:  .ASCII  <ACRLF>/CONSOLE & /
014054  116     123     117
014057  114     105     040
014062  046     040
014064  060     060     040     DL11S1: .ASCIZ  /00 DL11'S UNDER TEST/<ACRLF><12>
014067  104     114     061
014072  061     047     123
014075  040     125     116
014100  104     105     122
014103  040     124     105
014106  123     124     200
014111  012     000
014113  007     002     200     HDRMSG: .ASCIZ  <7><2><ACRLF><17><12>/TEST #/
014116  017     012     124
014121  105     123     124
014124  040     043     000
014127  060     060     060     HDR0:   .ASCIZ  /000 COLUMNS/<ACRLF><12>
014132  040     103     117
```

```
                014135  114  125  115
                014140  116  123  200
                014143  012  000
1200            014145  124  131  120  E025MA: .ASCII  /TYPE ANY PRINTABLE CHARACTER /
                014150  105  040  101
                014153  116  131  040
                014156  120  122  111
                014161  116  124  101
                014164  102  114  105
                014167  040  103  110
                014172  101  122  101
                014175  103  124  105
                014200  122  040
1300            014202  101  116  104           .ASCIZ  /AND LISTEN FOR BELL................./
                014205  040  114  111
                014210  123  124  105
                014213  116  040  106
                014216  117  122  040
                014221  102  105  114
                014224  114  056  056
                014227  056  056  056
                014232  056  056  056
                014235  056  056  056
                014240  056  056  056
                014243  056  000
1400            014245  200  116  117  E025MB: .ASCIZ  <ACRLF>/NOT ENOUGH COLUMNS/<ACRLF>
                014250  124  040  105
                014253  116  117  125
                014256  107  110  040
                014261  103  117  114
                014264  125  115  116
                014267  123  200  000
1500            014272  200  105  103  ECOEND: .ASCIZ  <ACRLF>/ECHO TEST TERMINATED/<ACRLF>
                014275  110  117  040
                014300  124  105  123
                014303  124  040  124
                014306  105  122  115
                014311  111  116  101
                014314  124  105  104
                014317  200  000
1600            014321  040  040       E023M:  .ASCII  /  /
1700            014323  040  040  040  LINE5:  .ASCII  /    /          ;MESG FOR TEST E024
                014326  040
1800            014327  040  040  040  LINE5A: .ASCIZ  /        /<ACRLF>
                014332  040  040  040
                014335  040  040  200
                014340  000
1900            014341  200  017  012  MESG3:  .ASCIZ  <ACRLF><17><12>/SELECT TEST NUMBER  /
                014344  123  105  114
                014347  105  103  124
                014352  040  124  105
                014355  123  124  040
                014360  116  125  115
                014363  102  105  122
                014366  040  040  000
2000            014371  105  126  105  EVEN:   .ASCII  /EVEN/
                014374  116
```

```
   2100 014375      117      104      104  ODD:     .ASCII  /ODD /
        014400      040
   2200 014401      124      131      120  OPMSG:   .ASCIZ  /TYPE ANY CHARACTER/
        014404      105      040      101
        014407      116      131      040
        014412      103      110      101
        014415      122      101      103
        014420      124      105      122
        014423      000
   2300 014424      125      123      105  NOSWR:   .ASCIZ  /USE SOFTWARE SWITCH REG AT MEMORY ADDR 176/<7>
        014427      040      123      117
        014432      106      124      127
        014435      101      122      105
        014440      040      123      127
        014443      111      124      103
        014446      110      040      122
        014451      105      107      040
        014454      101      124      040
        014457      115      105      115
        014462      117      122      131
        014465      040      101      104
        014470      104      122      040
        014473      061      067      066
        014476      007      000
   2400
   2500
   2600           000001                        .END
```

SYMBOL TABLE

```
ACRLF = 000200          CHAINN  001412          EO25MA  014145          PRGTAB  002522          START3  000772
ADJR4   012032          CHAINY  001534          EO25MB  014245          PRINTC= 104015          STLSPV  003406
ADTENP  004100          CHALT = 104006          ERR     003320          PRNT  = 104017          STLSRV  003356
AREAD = 104021          CHLT    000720          ERRHLT  003354          PRTHDR= 104016          STPCHV= 104004
AT0     005266          CKPOS   011764          ERROR = 104001          PRTY4 = 000200          STPPA   003424
AT0X    005270          CNTLSW  000634          EVEN    014371          PRTY7 = 000340          STPRA   003374
AT1     005320          CNTR    000716          FORWD = 104024          PSW   = 177776          STRDRV= 104003
AT10    005744          CNVCTR  004072          FORWDA  003614          PT0     007372          STRLN   012660
AT11    006002          CONADD  000602          FORWDB  003622          PT1     007446          SWREG   000176
AT12    006042          CONIT   003710          FSTDL   000632          PT10    011266          TEMP    000712
AT13    006116          CONSET  003714          HDRMSG  014113          PT11    011424          TEMPCH  000700
AT14    006176          CONVEC  000604          HDR0    014127          PT12    011456          TENPWR  004076
AT15    006262          COUNT3  000666          HERE    011532          PT12A   011464          TERM    013154
AT16    006362          CR    = 104022          ICTR    000660          PT17    011546          TESTC   002460
AT17    006430          CRBUF   000646          IDEZ    007676          PT17B   011536          TIMER   000672
AT2     005352          CRLF  = 104012          INCHK   000710          PT17D   011576          TKB     000614
AT20    006500          CTRA    000650          LEVEL   000654          PT2     007570          TKLVL   000624
AT21    006572          CURTST  000676          LF    = 104014          PT3     010164          TKS     000612
AT22    006672          DELAY = 104010          LFCNT   000706          PT4     010304          TKVTR   000622
AT23    007000          DIGIT   004074          LINE3   010444          PT5     010462          TPB     000620
AT24    007112          DIRTN   012112          LINE5   014323          PT5AL   010630          TPBS    004004
AT25    007212          DISPRE  000174          LINE5A  014327          PT6     010666          TPLVL   000630
AT26    007270          DLADR   000606          LOGICA  011522          PT7     011054          TPS     000616
AT3     005404          DLCNT   000656          LSI11 = 001000          READ  = 104020          TPSS    004002
AT4     005436          DLNR    000610          MACHER  000004          READC = 104025          TPVTR   000626
AT5     005526          DLY     003436          MESG3   014341          READ1   004212          TTYCTL= 104011
AT6     005604          DL11S   014051          MG24    013010          REF     010414          TTY1    001776
AT7     005674          DL11S1  014064          MG25    013014          REPT    000662          TTY1B   002062
BIT0  = 000001          ECOEND  014272          MONIC   012272          RESTRT  003516          TYP     003076
BIT1  = 000002          EHALT = 104002          MOVNUM  012736          RTNNO   000636          TYPE  = 104000
BIT10 = 002000          EHLT    003346          NEXT    001654          SAVR6   003514          TYPEM = 104007
BIT11 = 004000          EMTINT  002722          NEXT1   001674          SCOPSW= 040000          TYPM    003164
BIT12 = 010000          EMTTAB  002776          NITRSW= 004000          SCOPTR  000642          WAITF   001700
BIT13 = 020000          ENDPAS  014023          NOSWR   014424          SCRLF = 104013          WIDTH   000652
BIT14 = 040000          END2    001332          NPCODE  010137          SELHLT  000734          XCSR    000670
BIT15 = 100000          END2A   001320          NXTST   000640          SKIP    001630          $AREAD  003640
BIT2  = 000004          END3    001262          ODD     014375          SPARET  003072          $BTASC  004006
BIT3  = 000010          END4    001334          OPEN  = 000000          SPBOT   000600          $CR     003226
BIT4  = 000020          EO20    012116          OPMSG   014401          SPC     007560          $CRLF   003214
BIT5  = 000040          EO21    012166          OUTPUT  013112          SPCNT   000674          $FORWD  003562
BIT6  = 000100          EO21A   012174          PARITY  000702          SPSP    007540          $LF     003216
BIT7  = 000200          EO22    012224          PASCNT  012114          SP2     007552          $PRHDR  003236
BIT8  = 000400          EO22A   012232          PASMES  014042          SR      000714          $PRNT   004314
BIT9  = 001000          EO23    012476          PCHAR   000704          START   001010          $PRTC   004324
BRCTR   000664          EO23M   014321          PFAIL   003460          STARTM  013676          $READ   004112
BTOASC= 104023          EO24    013020          POPSP = 005726          STARTX  001024          $READC  004204
BUFR    013164          EO24B   013026          POPSP2= 022626          START1  000736          $SCRLF  003142
CHAIN = 104005          EO25    013566          PRGID   000644          START2  000754

. ABS.  014500      000
        000000      001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  2846 WORDS  ( 12 PAGES)
DYNAMIC MEMORY:  3844 WORDS  ( 14 PAGES)
ELAPSED TIME:  00:00:52
CZLACE.BIN,CZLACE.LST/-SP=CZLACE.MAC
```