IDENTIFICATION

Product Code: AC-8898E-MC

Product Name: CZLACE0 LA36 TERM (DL11 & KL11)

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Maintainer: DIAGNOSTIC GROUP

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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 failure in the AREAD routine because the 200 msec. delay is not of sufficient duration to allow setting of the Receiver Register Status "DONE" bit through the Maintenance 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,and 66 do not run properly when run on an LSI-11. This problem was resolved 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 resulting in the loss of this information and consequent failure. Instructions were included to save the contents of R0 on entry into the routine and to restore them upon exit.

1.2.4 Loss of stack contents for non-LSI-11 computers due to incorrect seguence of instructions in 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
0
MO-11-DZLAC-D-1.

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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 corres

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 applicable PDP-11 diagnostics should be run on the processor. If any errors are 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 functions only. If the terminals under test have hardware options installed run diagnostic 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 description 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 diagnostic. 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 will 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 program 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 interface.

4.0 STARTING PROCEDURE

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, 11/03. 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.

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. During the
halt, any of the control switches may be changed or set as desired.

5.1.2 Switch 14

Placing switch 14 in the up position will cause the program to continue on errors during any of the I/O tests only. With switch 14 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 program to continue if switch 14 is down. With switch 14 up, pressing continue 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 information returned to the program from the terminal. Therefore the program cannot report errors occurring in the terminal. Errors detected during the interface tests will result in halts as described above.

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 switch 13 is up, only the console terminal is driven.

** Note: Switch 13 should 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 completion 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 setting switch 8 up before starting the diagnostic. Upon completion of the I/O test sequence (if being run) the program will either halt at SELHLT waiting for a test selection via the switch register or print the select test message and wait for a test selection from any keyboard. Refer to Section 4 for further information.

5.1.7 Switches 5 to 0

Switches 5 to 0 are used to select specific tests when under switch register control. 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 maximum number of columns the diagnostic is to test. If the number set is greater than 132(10) or less than 30(10), the program will default to 132(10). The value set must be in octal form. Thus, for normal operation leave switches 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 register 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*
```

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, 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 se
parating 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.

With the Auto Line Feed Option set to produce an automatic
line feed
after every received carriage return, there will be a blank l
ine
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 from all even numbered columns and the spacing of the solenoid head from the left margin. It is also a good check for proper operation of the position decoder.

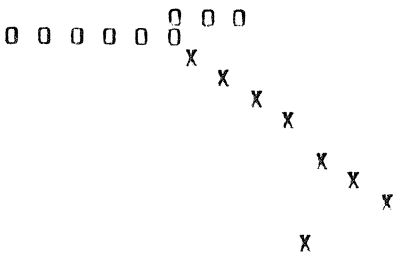
The test prints a full line of alternating 0's and spaces, starting with a 0. At the end of the line the print head is returned to the left margin with a carriage return. The spaces are then filled in by spacing the print head out from the left margin to the first space, printing an "X", and executing a carriage return. This pattern is repeated until the line is completed. Check to see that all X's are in the middle of the space between the two zeroes on either side of it.

EXAMPLE:

```
          0X0X0X0X0X0X0X0X0X0X0X0X0
X0X0X
```

With the Auto Line Feed Option set to produce an automatic line feed 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 Lines
s
              /
          32
              \
               31 Blank Lines
              /
          00-----------------------------------------------
```

6.1.6 Test 5 - Single Line Feed Test

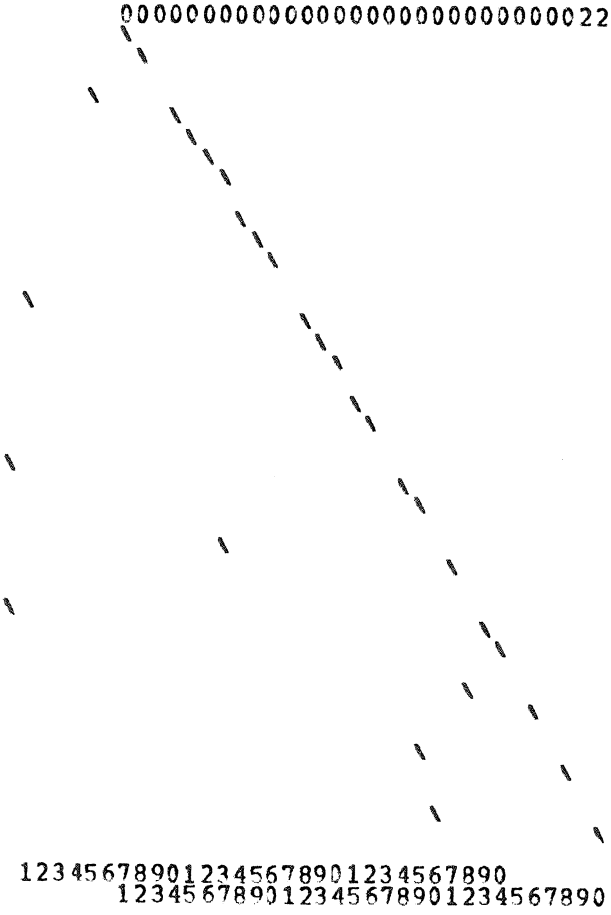
This test is designed to check the timing of single line feeds and the capability of doing line feeds in all columns. Two reference lines are used by this test (and Test 6) which also can be used to easily check the number of columns the printer is printing.

The first reference line contains 130(10) zeroes followed by two 2's if testing 132(10) columns. If less than 132 columns, the line will contain 0's for two less than the maximum number of columns followed by the two 2's. This reference line is a quick check for 132(10) columns if testing the full 132(10) columns. The second reference line prints a string of numbers (1 to 9 & 0) repeated to the maximum column. This line, again, can be used as a quick check of the number of columns.

The line feed test is accomplished by: printing the 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 testing less than 132(10) columns. If testing 132(10) columns, nothing should 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 right, a carriage return - line feed will be sent followed by repeated backslashes "\" and linefeeds to print a diagonal line down the paper. When a backslash is printed in the maximum column, a carriage return will be sent immediately after the line feed and the second reference line of sequential numbers 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 function to complete. After the delay, the reference line will be repeated, the last line being guaranteed to be correct. Any timing problems

during th
e line feeds will show as misprints or missing characters
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.

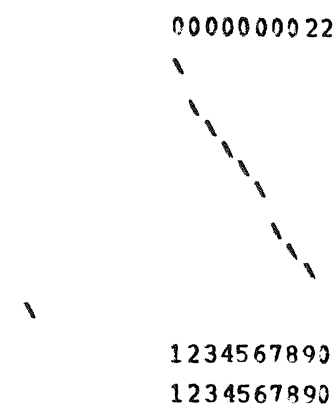
EXAMP
LE:



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.

EXAMPLE:



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.

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
        XXXXXXXXXXXXXXXXXXXXXXXXXXXX

     12345678901234567890123456789O
          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
   @ @ @ @ @ @ @ @ @ @ @ @ @

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

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

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

& & & & & & & & & & &
& & & & & & & & & & &
& & & & & & & & & &
&

6.1.9 Test 10 - Printing Frequency Sweep Test

This test prints the character "H" repeatedly, 30(10) characters per line for four lines. During the first two lines, the time interval between characters is increased from 30(10) milliseconds to 1.8 seconds using the following formula to create a logarithmic increase:

New Delay = Old Delay + Old Delay/16 + Old Delay/128

The last two lines do just the reverse. The time interval between characters 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 of the characters or spaces between characters as an indication of timing problems.

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:

```
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHH

         HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
H
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
```

6.1.10 Test 11 - Ribbon Feed Test

This test checks the ribbon feed mechanism by printing a single column of 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
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

This test checks the printer bell buffer to insure that eight bells are distinctly 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

This 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 each character is overprinted 4 times to conserve paper. At the end of each complete pass through the character set, a message is printed indicating the number of passes executed. If any character (except "Rubout") is typed on the keyboard 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
          BBBBBBBBBBBBBBBBBBBBBBBB
BBBBBB
```

If the Auto Line Feed Option is set to produce an automatic line feed 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 between each group of characters.

EXAMPLE:

```
          AAAAAAAAAAAAAA
```

AAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAA

AAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAA

BBBBBBBBBBBBBBB

BBBBBBBBBBBBBBB
BBBBBBBBBBBBBBB
BBBBBBBBBBBBBBB

BBBBBBBBBBBBBBB
BBBBBBBBBBBBBBB

6.2 ECHO TESTS

These tests are designed as a test of the keyboard and an aid in isolating troubles within the terminal. At the beginning of each test, the test number will be printed indicating which test is being executed. Typing a "RUBOUT" or "DELETE" at any time, whether in keyboard control or not, will exit the current Echo test and print a test termination message. If in keyboard control, the select test message will be printed and the program will await a test selection as usual. In switch register control, the program will halt (at SELLHLT) waiting for control via the switch register. A detailed description of each test follows:

6.2.1 Test 20 - Character Echo Test

This test is designed to operate the terminal in a simulated local mode. Any character typed on the keyboard (except a "rubout") will be echoed to the printer.

If the LA36 terminal is in half duplex with the Auto Line Feed Option available, typing a carriage return may cause a garbled response on the terminal during this test.

6.2.2 Test 21 - Line Echo Test, Fast Rate

This test continually sends full lines of any character up to the maximum 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 typed or the test is terminated by typing a "rubout". The characters are transmitted 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.

TABLE OF CONTENTS

SEQ 0046

```
                        .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
```


SEQ 0047

```
                        .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 "DLV".
                ;       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
```



```
104014                          LF=EMT+14
104015                          PRINTC=EMT+15
104016                          PRTHDR=EMT+16
104017                          PRNT=EMT+17
104020                          READ=EMT+20
104021                          AREAD=EMT+21
104022                          CR=EMT+22
104023                          BTOASC=EMT+23
104024                          FORWD=EMT+24
104025                          READC=EMT+25
```

```
                                        .SBTTL  TRAP CATCHER & STARTING ADDRESSES
                                ;
                                        .ENABL  ABS,AMA
                                        .ASECT

                        000000          .=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

                        000042          .=42

000042  000000                        0

                        000046          .=46

000046  011522                        LOGICAL

                        000052          .=52

000052  010000                        010000

                        000174          .=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

                        000600          .=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          LPCNT:  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
```

SEQ 0052

23900

SEQ 0053

```
                                        .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     #ATI,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    #ATI,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,WACHER       ;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 ASCII COLUMN VALUE
001206  012702  000003                  MOV     #3,R2           ;DO A 3 CHAR. CONVERSION
001212  104423                          BTOASC                  ;CONVERT NO. COLUMNS TO ASCII
001214  000401                  4$:     BR      5$
001216  000410                          BR      6$
001220  012700  000000          5$:     MOV     #0,R0           ;TRANSMIT A
001224  104415                          PRINTC                  ;NULL CODE
001226  104007                          TYPEM                   ;TYPE PROGRAM TITLE FIRST TIME RUN
001230  013676                          STARTM
001232  012767  000240  177754          MOV     #NOP,4$
```



```
                                        ;**********
                                        ;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  022526                 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
```



```
001560  012767  000006  176216                 MOV     #6,MACHER       ;CLEAN UP
001566  012706  000600                         MOV     #SPBOT,SP       ;SET UP STACK POINTER
001572  104024                                 FORWD                   ;SET UP VALUES FOR NEXT TEST
001574  022767  177777  177036                 CMP     #-1,NXTST       ;END OF I/O TESTS (=-1)
001602  001004                                 BNE     2$              ;BRANCH IF NOT END
001604  012767  005266  177026                 MOV     #ATO,NXTST      ;RESET NXTST TO FIRST I/O TEST
001612  104024                                 FORWD                   ;SET UP VALUES FOR NEXT TEST
001614  000177  177056                 2$:     JMP     @CURTST         ;GO TO TEST
001620  022767  177777  177012         3$:     CMP     #-1,NXTST       ;END OF I/O TESTS (=-1)
001626  001012                                 BNE     NEXT            ;BRANCH IF NOT
001630  032777  000400  177056         SKIP:   BIT     #BIT8,@SR       ;TEST IF WANT TEST SELECTION RIGHT AWAY
001636  001016                                 BNE     NEXT1           ;BRANCH IF NOT
001640  052767  000200  176776                 BIS     #BIT7,PRGID     ;BYPASS SCOPING
001645  012767  007372  176764                 MOV     #PTO,NXTST      ;PROD TESTING, GO TO PRINTER TESTS
001654  012767  000006  176122         NEXT:   MOV     #6,MACHER       ;CLEAN UP
001662  012706  000600                         MOV     #SPBOT,SP       ;SET UP STACK POINTER
001666  104024                                 FORWD                   ;SET UP NEXT TEST PARAMETERS
001670  000177  177002                         JMP     @CURTST         ;GO TO ROUTINE
001674  005267  176754                 NEXT1:  INC     LEVEL
                                        ;**********
                                        ;WAIT FOR FURTHER INSTRUCTIONS:
                                        ;       -LOAD PROGRAM NUMBER INTO BITS 0-5 OF THE SR
                                        ;       -SET SR BIT 11=1 TO LOOP ON SELECTED TEST
                                        ;       -SET SR BIT 11=0 AND BIT 8=0 TO LOOP THROUGH
                                        ;        SEQUENCE OF SELECTED TESTS.
                                        ;       -SET SR BIT 11=0 AND BIT 8=1 TO HALT AGAIN AFTER
                                        ;        EXECUTING TEST ONCE
                                        ;**********
001700  104006                 WAITF:  CHALT                   ;OR TTYCTL IF START WAS AT 210
001702  012767  000006  176074         MOV     #6,MACHER       ;CLEAN UP
001710  012706  000600                 MOV     #SPBOT,SP       ;SET UP STACK POINTER
001714  017700  176774                 MOV     @SR,R0          ;GET CURRENT SW REG
001720  042700  177700                 BIC     #177700,R0
001724  020027  000037                 CMP     R0,#37          ;TEST IF PROG NO. IS I/O TEST
001730  101403                         BLOS    1$              ;BRANCH IF 0 OR LT 37. AN ECHO OR PRINTER
001732  005367  176706                 CLR     PRGID           ;I/O TEST, CLEAR PRGID
001736  000403                         BR      2$
001740  052767  000200  176676  1$:     BIS     #BIT7,PRGID     ;BYPASS SCOPING
001746  000241                 2$:     CLC                     ;CLEAR C BIT
001750  006100                         ROL     R0              ;GET PROGRAM ADDRESS OUT OF
001752  016067  002522  176660         MOV     PRGTAB(R0),NXTST;PROGRAM ADDRESS TABLE
001760  026727  176654  001700         CMP     NXTST,#WAITF    ;TEST IF LEGAL TEST NO.
001766  001744                         BEQ     WAITF           ;BRANCH IF ILLEGAL
001770  104024                         FORWD                   ;SET UP TEST PARAMETERS
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.
                                        ;**********

002000 001776  022626                   TTY1:   POPSP2                  ;POP 2 FROM STACK
002100 002000  105777  176606                    TSTB    @TKS            ;TEST IF ANY INPUT
002200 002004  100013                           BPL     1$              ;BRANCH IF NOT
002300 002006  017705  176602                    MOV     @TKB,R5         ;GET CHAR
002400 002012  042705  177600                    BIC     #177600,R5      ;MASK BITS
002500 002016  020527  000177                    CMP     R5,#177         ;CHECK IF RUBOUT
002600 002022  001004                           BNE     1$              ;BRANCH IF NOT
002700 002024  042767  004400  176602            BIC     #4400,CNTLSW    ;CLEAR LOOP BITS
003000 002032  000413                           BR      TTY1B
003100 002034  032767  004000  176572  1$:       BIT     #NITRSW,CNTLSW  ;CHECK IF LOOP ON TEST
003200 002042  001401                           BEQ     2$              ;BRANCH IF NO LOOP ON TEST
003300 002044  000002                           RTI                     ;LOOP ON TEST
003400 002046  032767  000400  176560  2$:       BIT     #BIT8,CNTLSW    ;TEST IF LOOP ON SEQUENCE
003500 002054  001402                           BEQ     TTY1B           ;BRANCH IF NO LOOP ON SEQUENCE
003600 002056  000167  177452                    JMP     CHAINV          ;CHAIN TO NEXT TEST
003700 002062  012767  177777  176620  TTY1B:    MOV     #-1,INCHK       ;STOP INPUT CHECKING
004000 002070  012700  000036                    MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
004100 002074  104010                           DELAY
004200 002076  104007                           TYPEM
004300 002100  014341                           MESG3                   ;TYPE MESSAGE
004400 002102  005067  176602                    CLR     INCHK           ;ALLOW INPUT CHECKING AGAIN
004500 002106  104020                   1$:     READ                    ;WAIT FOR INPUT
004600 002110  026727  176564  000040            CMP     TEMPCH,#40      ;TEST IF CHAR IS A SPACE
004700 002116  001773                           BEQ     1$              ;BRANCH IF YES
005000 002120  012700  000036                    MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
005100 002124  104010                           DELAY
005200 002126  104017                           PRNT                    ;READY?
005300 002130  117777  176460  176462            MOVB    @TKB,@TPB       ;ECHO CHAR
005400 002136  004767  000316                    JSR     PC,TESTC        ;CHECK IF CHAR IS OK
005500 002142  000541                           BR      8$              ;NO, ERROR
005600 002144  010005                           MOV     R0,R5           ;OK, PUT CHAR INTO R5
005700 002146  006305                           ASL     R5              ;SHIFT INTO POSITION 5-3
006000 002150  006305                           ASL     R5
006100 002152  006305                           ASL     R5
006200 002154  104020                   2$:     READ                    ;WAIT FOR NEXT CHAR
006300 002156  026727  176516  000040            CMP     TEMPCH,#40      ;CHECK IF A SPACE
006400 002164  001773                           BEQ     2$              ;BRANCH IF SPACE
006500 002166  012700  000036                    MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
006600 002172  104010                           DELAY
006700 002174  104017                           PRNT                    ;READY?
006800 002176  117777  176412  176414            MOVB    @TKB,@TPB       ;ECHO CHAR
007000 002204  004767  000250                    JSR     PC,TESTC        ;CHECK IF CHAR IS OK
007200 002210  000516                           BR      8$              ;ERROR IN CHAR
007300 002212  060005                           ADD     R0,R5           ;OK,R5 NOW = OCTAL TEST NO.
```



```
007400 002214  104020                   3$:     READ
007500 002216  026727  176456  000040            CMP     TEMPCH,#40      ;CHECK IF SPACE
007600 002224  001773                           BEQ     3$              ;BRANCH IF SPACE
007700 002226  012700  000036                    MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
010000 002232  104010                           DELAY
010100 002234  104017                           PRNT                    ;READY?
010200 002236  117777  176352  176354            MOVB    @TKB,@TPB       ;ECHO CHAR
010300 002244  012767  004001  176362            MOV     #4001,CNTLSW    ;SET BITS 11 & 0
010400 002252  026727  176422  000114            CMP     TEMPCH,#114     ;NO, IS IT AN "L" ?
010500 002260  001427                           BEQ     5$              ;BRANCH IF YES
010600 002262  026727  176412  000154            CMP     TEMPCH,#154     ;CHECK LOWER CASE
010700 002270  001423                           BEQ     5$
011000 002272  026727  176402  000123            CMP     TEMPCH,#123     ;NO, IS IT AN "S"
011100 002300  001414                           BEQ     4$              ;BRANCH IF YES
011200 002302  026727  176372  000163            CMP     TEMPCH,#163     ;CHECK LOWER CASE
011300 002310  001410                           BEQ     4$
011400 002312  026727  176362  000056            CMP     TEMPCH,#56      ;NO, IS IT A "." ?
011500 002320  001052                           BNE     8$              ;NO, ERROR
011600 002322  012767  000001  176304            MOV     #1,CNTLSW       ;YES SET ONLY BIT 0 IN CONTROL WD
011700 002330  000403                           BR      5$
011800 002332  012767  000401  176274  4$:       MOV     #401,CNTLSW     ;SET BITS 8 & 0
012000 002340  012767  000006  175436  5$:       MOV     #6,MACHER       ;CLEAN UP
012100 002346  012706  000600                    MOV     #SBOT,SP        ;INIT SP
012200 002352  020527  000040                    CMP     R5,#40          ;IS THIS AN I/O TEST
012300 002356  103033                           BHIS    8$              ;BRANCH IF YES
012400 002360  020527  000030                    CMP     R5,#30          ;IS THIS AN OPTION TEST?
012500 002364  103007                           BHIS    6$              ;SKIP IF YES
012600 002366  020527  000020                    CMP     R5,#20          ;IS THIS AN ECHO TEST
012700 002372  103404                           BLO     6$              ;BRANCH IF NOT
013000 002374  012767  000001  176232            MOV     #1,CNTLSW       ;FORCE ECHO TEST TO A SINGLE RUN
013100 002402  000402                           BR      7$              ;LEAVE THIS TERMINAL AS CONSOLE
013200 002404  004767  001300            6$:     JSR     PC,CONIT        ;RESET CONSOLE TERMINAL ADDRESS
013300 002410  052767  000200  176226  7$:       BIS     #BIT7,PRGID     ;BYPASS SCOPING
013400 002416  000241                           CLC                     ;CLEAR C BIT
013500 002420  006105                           ROL     R5
013600 002422  016567  002522  176210            MOV     PRGTAB(R5),NXTST;ADDR OF TEST TO NXTST
013700 002430  026727  176204  001700            CMP     NXTST,#WAITF    ;CHECK IF TEST EXISTS
014000 002436  001403                           BEQ     8$              ;BRANCH IF NOT
014100 002440  104024                           FORWD                   ;SET UP TEST PARAMETERS
014200 002442  000177  176230                    JMP     @CURTST         ;GO TO TEST
014300 002446  104017                   8$:     PRNT                    ;CHECK IF PRINTER IS READY
014400 002450  112777  000077  176142            MOVB    #77,@TPB        ;SEND A "?"
014500 002456  000601                           BR      TTY1B           ;TRY AGAIN
```

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



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002522  007372          PRGTAB: PT0                     ;DATA PATH TEST
002524  007446                  PT1                     ;PRINTER CHARACTER TEST
002526  007570                  PT2                     ;NON-PRINTING CHARACTER TEST
002530  010164                  PT3                     ;CARRIAGE RETURN TEST
002532  010304                  PT4                     ;MULTIPLE LINE FEED TEST
002534  010462                  PT5                     ;SINGLE LINE FEED TEST
002536  010666                  PT6                     ;BACKSPACE TEST
002540  011054                  PT7                     ;OVERPRINT TEST
002542  011266                  PT10                    ;PRINTING FREQUENCY SWEEP TEST
002544  011424                  PT11                    ;RIBBON FEED TEST
002546  011456                  PT12                    ;PRINTER BELL TEST
002550  001700                  WAITF                   ;SPARE
002552  001700                  WAITF                   ;SPARE
002554  001700                  WAITF                   ;SPARE
002556  001700                  WAITF                   ;SPARE
002560  011546                  PT17                    ;LIFE TEST
002562  012116                  EO20                    ;CHARACTER ECHO TEST
002564  012166                  EO21                    ;LINE ECHO TEST, FAST RATE
002566  012224                  EO22                    ;LINE ECHO TEST, SLOW RATE
002570  012476                  EO23                    ;CHARACTER/CODE ECHO TEST
002572  013020                  EO24                    ;SELECTIVE PATTERN ECHO TEST
002574  013566                  EO25                    ;BELL ECHO TEST
002576  001700                  WAITF                   ;SPARE
002600  001700                  WAITF                   ;SPARE
002602  001700                  WAITF           ;SPARE
002604  001700                  WAITF           ;SPARE
002606  001700                  WAITF           ;SPARE
002610  001700                  WAITF           ;PRARE
002612  001700                  WAITF           ;SPARE
002614  001700                  WAITF           ;SPARE
002616  001700                  WAITF                   ;SPARE
002620  001700                  WAITF                   ;SPARE
002622  005266                  AT0                     ;I/O TEST NO. 40
002624  005320                  AT1                     ;I/O TEST NO. 41
002626  005352                  AT2                     ;I/O TEST NO. 42
002630  005404                  AT3                     ;I/O TEST NO. 43
002632  005436                  AT4                     ;I/O TEST NO. 44
002634  005526                  AT5                     ;I/O TEST NO. 45
002636  005604                  AT6                     ;I/O TEST NO. 46
002640  005674                  AT7                     ;I/O TEST NO. 47
002642  005744                  AT10                    ;I/O TEST NO. 50
002644  006002                  AT11                    ;I/O TEST NO. 51
002646  006042                  AT12                    ;I/O TEST NO. 52
002650  006116                  AT13                    ;I/O TEST NO. 53
002652  006176                  AT14                    ;I/O TEST NO. 54
002654  006262                  AT15                    ;I/O TEST NO. 55
002656  006362                  AT16                    ;I/O TEST NO. 56
002660  006430                  AT17                    ;I/O TEST NO. 57
002662  006500                  AT20                    ;I/O TEST NO. 60
002664  006572                  AT21                    ;I/O TEST NO. 61
002666  006672                  AT22                    ;I/O TEST NO. 62
002670  007000                  AT23                    ;I/O TEST NO. 63
002672  007112                  AT24                    ;LSI TEST NO. 64
002674  007212                  AT25                    ;LSI TEST NO. 65
002676  007270                  AT26                    ;LSI TEST NO. 66
002700  001700                  WAITF                   ;SPARE
002702  001700                  WAITF                   ;SPARE
```

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 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
 43920 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                   $APEAD                  ;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  003772                   SPARET                  ;SPARE EMT
 45000 003054  003772                   SPARET                  ;SPARE EMT
 45100 003056  003772                   SPARET                  ;SPARE EMT
 45200 003060  003772                   SPARET                  ;SPARE EMT
 45300 003062  003772                   SPARET                  ;SPARE EMT
 45400 003064  003772                   SPARET                  ;SPARE EMT
```



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 45500 003066  003772                   SPARET                  ;SPARE EMT
 45600 003070  003772                   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                  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
```

```
61200                                   ;**********
61300                                   ;
61400                                   ;DELAY--A COMMON ROUTINE TO DELAY PROCESSING
61500                                   ;       A GIVEN NUMBER OF MSEC.
61600                                   ;       CALLING SEQUENCE:
61700                                   ;       MOV   #5,R0    ;R0 CONTAINS THE NUMBER OF MSEC DELAY DESIRED
61800                                   ;       DELAY
61900                                   ;
62000                                   ;       THE DELAY IS EFFECTED BY THE EXECUTION OF THE LOOP;
62100                                   ;          1$:  DEC  R1
62200                                   ;               BNE  1$
62300                                   ;
62400                                   ;       SINCE THE EXECUTION TIMES OF THE PDP11 LINE DOES VARY FROM
62500                                   ;       MACHINE TO MACHINE, THE VALUE AT SYMBOLIC LOCATION
62600                                   ;       "TIMER" MUST BE CHANGED TO THE APPROPRIATE VALUE AS SHOWN BELOW
62700                                   ;       BEFORE STARTING THE DIAGNOSTIC. "TIMER" IS INITIALIZED
62800                                   ;       FOR AN 11/05,11/10(=251).
62900                                   ;
63000                                   ;MACHINE        05&10   35&40   15&20   LSI&03          11/45 & 11/70
63100                                   ;                                                BIPOLAR         MOS       CORE
63200                                   ;
63300                                   ;LOOP: DEC R1   3.4     .99     2.3                .30           .51     .90
63400                                   ;      BNE LOOP 2.5     1.76    2.6                .60           .98     1.13
63500                                   ;  TIME=        5.9USEC 2.75    4.9     7.7     .90USEC       1.49USEC          2.03USEC
63600                                   ; SET TIMER     251     554     314     202     2127          1237    755
63700                                   ;
63800                                   ;XXXXXXXXXX
63900
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
```



```
  200                                   ;
  300                                   ;**********
  400 003460  010046                    PFAIL:  MOV     R0,-(SP)
  500 003462  010146                            MOV     R1,-(SP)
  600 003464  010246                            MOV     R2,-(SP)
  700 003466  010346                            MOV     R3,-(SP)
  800 003470  010446                            MOV     R4,-(SP)
  900 003472  010546                            MOV     R5,-(SP)
 1000 003474  016746  174324                    MOV     24,-(SP)
 1100 003500  010667  000010                    MOV     SP,SAVR6        ;SAVE STACK POSITION
 1200 003504  012767  003516  174312            MOV     #RESTRT,24      ;STORE RESTART ADDRESS
 1300 003512  000000                            HALT
 1400 003514  000000                    SAVR6:  .WORD   0
 1500 003516  104007                    RESTRT: TYPEM
 1600 003520  003552                            1$
 1700 003522  016706  177766                    MOV     SAVR6,SP        ;RESTORE STACK POINTER
 1800 003526  012667  174272                    MOV     (SP)+,24        ;RESTORE PFAIL ADDRESS
 1900 003532  012605                            MOV     (SP)+,R5
 2000 003534  012604                            MOV     (SP)+,R4
 2100 003536  012603                            MOV     (SP)+,R3
 2200 003540  012602                            MOV     (SP)+,R2
 2300 003542  012601                            MOV     (SP)+,R1
 2400 003544  012600                            MOV     (SP)+,R0
 2500 003546  000167  175236                    JMP     START
 2600
 2700 003552     200     120     117    1$:     .ASCIZ  <ACRLF>/POWER/<ACRLF>
      003555     127     105     122
      003560     200     000
 2800                                           .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+2,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
```



```
                                        ;XXXXXXXXXX
                                        ;
                                        ;READ-- A COMMON ROUTINE WHICH CHECKS THE KEYBOARD
                                        ;       DONE FLAG & SETS A FLAG INDICATING CHAR PARITY
                                        ;
                                        ;XXXXXXXXXX
004112  004767  177572          $READ:  JSR     PC,CONIT        ;RESET CONSOLE ADR AND VECTORS
004116  005767  174534                  TST     DLCNT           ;CHECK IF MULTI DL11'S AVAILABLE
004122  001430                          BEQ     $READC          ;NONE, WAIT FOR CONSOLE INPUT
004124  016767  174526  174534  1$:     MOV     DLCNT,COUNT3    ;SET DL11 COUNT
004132  016767  174474  174530          MOV     FSTDL,XCSR      ;ADDRESS OF FIRST DL11 INTO XCSR
004140  105777  174524          2$:     TSTB    @XCSR           ;TEST IF ANY INPUT
004144  100005                          BPL     3$              ;CONTINUE IF NO INPUT
004146  016700  174516                  MOV     XCSR,R0         ;SET THIS DL11 AS CONSOLE
004152  004767  177536                  JSR     PC,CONSET
004156  000415                          BR      READ1           ;READ CHAR AND RETURN
004160  005367  174502          3$:     DEC     COUNT3          ;DECREMENT DL11 COUNT
004164  001404                          BEQ     4$              ;TEST CONSOLE WHEN DONE DL11'S
004166  062767  000010  174474          ADD     #10,XCSR        ;NEXT DL11 ADDRESS
004174  000761                          BR      2$              ;CONTINUE
004176  105777  174410          4$:     TSTB    @TKS            ;CHECK CONSOLE
004202  100350                          BPL     1$              ;WAIT, NO INPUT
004204  105777  174402          $READC: TSTB    @TKS            ;CHECK KEYBOARD DONE FLAG
004210  100375                          BPL     $READC          ;BRANCH IF NOT SET
004212  117767  174376  174460  READ1:  MOVB    @TKB,TEMPCH     ;SAVE CHARACTER
004220  116767  174454  174456          MOVB    TEMPCH,PCHAR    ;SAVE CODE WITH PARITY BIT
004226  042767  177400  174450          BIC     #177400,PCHAR   ;MASK UNWANTED BITS
004234  116767  174440  174441          MOVB    TEMPCH,PARITY+1 ;SAVE CHAR WITH PARITY BIT
004242  042767  177600  174430          BIC     #177600,TEMPCH  ;MAKE IT 7 BIT ASCII
004250  026727  174424  000004          CMP     TEMPCH,#4       ;DISREGARD EOT
004256  001715                          BEQ     $READ
004260  012700  000011                  MOV     #11,R0          ;SET SHIFT COUNT
004264  042767  000377  174410          BIC     #377,PARITY     ;CLEAR PARITY FLAG
004272  005300                  1$:     DEC     R0              ;DECREMENT SHIFT COUNT
004274  001406                          BEQ     2$              ;EXIT IF DONE
004276  106367  174401                  ASLB    PARITY+1        ;SHIFT CODE
004302  103373                          BCC     1$              ;CONTINUE IF BIT WAS ZERO
004304  105167  174372                  COMB    PARITY          ;CHANGE PARITY FLAG IF BIT WAS ONE
004310  000770                          BR      1$              ;CONTINUE
004312  000002                  2$:     RTI                     ;SET, RET. TO CALLER
                                        ;XXXXXXXXXX
                                        ;
                                        ;PRINT-- A COMMON ROUTINE TO CHECK THE PRINTER READY FLAG
                                        ;
                                        ;XXXXXXXXXX
004314  105777  174276          $PRNT:  TSTB    @TPS            ;CHECK PRINTER READY FLAG
004320  100375                          BPL     $PRNT           ;BRANCH IF NOT SET
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  $PRTC:  MOV     CONADD,TEMP     ;SET CONSOLE ADR
004330  062767  000004  174352          ADD     #4,TEMP
004336  105777  174346         1$:     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                  ;ADJUST STACK
```



```
004620  012700  000036                  MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
004624  104010                         DELAY
004626  104007                         TYPEM                   ;YES, TEST 21
004630  014272                         ECOEND                  ;PRINT TERMINATION MESSAGE
004632  104005                         CHAIN                   ;CHAIN TO NEXT TEST
004634  000167  005334                  JMP     EO21A           ;REPEAT TEST IF LOOP ON TEST SW SET
004640  026727  173772  000022  10$:    CMP     RTNNO,#22       ;CHECK IF TEST 22
004646  001011                         BNE     11$             ;NO, CHECK IF TEST 24
004650  022626                         POPSP2                  ;ADJUST STACK
004652  012700  000036                  MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
004656  104010                         DELAY
004660  104007                         TYPEM                   ;YES, PRINT TERMINATION MESSAGE
004662  014272                         ECOEND
004664  104005                         CHAIN                   ;CHAIN TO NEXT TEST
004666  000167  005340                  JMP     EO22A           ;REPEAT TEST IF LOOP ON TEST SW SET
004672  026727  173740  000024  11$:    CMP     RTNNO,#24       ;TEST 24?
004700  001133                         BNE     22$             ;WAIT FOR NEXT TEST IF NOT TEST 24
004702  022626                         POPSP2                  ;RESET STACK
004704  000167  006244                  JMP     TERM            ;TERMINATE TEST
004710  012700  000036          12$:    MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
004714  104010                         DELAY
004716  016700  173756                  MOV     TEMPCH,R0       ;SET NEW CHARACTER
004722  000403                         BR      14$             ;CONTINUE
004724  062767  000002  173736  13$:    ADD     #2,XCSR
004732  062767  000002  173730  14$:    ADD     #2,XCSR         ;SET STATUS ADDRESS IN XCSR
004740  016767  173636  173744          MOV     CONADD,TEMP     ;CHECK IF CONSOLE TERMINAL
004746  062767  000004  173736          ADD     #4,TEMP         ;IS THIS DL
004754  026767  173732  173706          CMP     TEMP,XCSR
004762  001420                         BEQ     17$
004764  105777  173700          15$:    TSTB    @XCSR           ;TEST PRINTER READY
004770  100375                         BPL     15$             ;WAIT FOR READY
004772  062767  000002  173670          ADD     #2,XCSR         ;SET XCSR TO PRINTER BUFFER
005000  010077  173664                  MOV     R0,@XCSR        ;LOAD CHARACTER INTO BUFFER
005004  005367  173656          16$:    DEC     COUNT3          ;DECREASE COUNT OF DL11'S
005010  001411                         BEQ     18$             ;ALL DONE,EXIT
005012  062767  000002  173650          ADD     #2,XCSR         ;SET XCSR TO NEXT DL11 PRINTER STATUS
005020  000167  177372                  JMP     4$              ;GO TEST NEXT DL11 READY FLAG
005024  062767  000002  173636  17$:    ADD     #2,XCSR         ;SET XCSR TO PRINTER BUFFER
005032  000764                         BR      16$             ;DO NOT LOAD BUFFER
005034  005767  173650          18$:    TST     INCHK           ;WANT INPUT CHECK?
005040  001111                         BNE     26$             ;NO, BRANCH
005042  026727  173570  000020          CMP     RTNNO,#20       ;PRINTING TEST?
005050  002004                         BGE     19$             ;BRANCH IF NOT
005052  022767  104011  174620          CMP     #TTYCTL,WAITF   ;KEYBOARD CONTROL?
005060  001101                         BNE     26$             ;SKIP INPUT CHECK IF NOT
005062  105777  173514          19$:    TSTB    @CONADD         ;TEST IF ANY INPUT
005066  100076                         BPL     26$             ;BRANCH IF NONE
005070  016767  173506  173614          MOV     CONADD,TEMP     ;SET ADR
005076  062767  000002  173606          ADD     #2,TEMP
005104  117767  173602  173566          MOVB    @TEMP,TEMPCH
005112  042767  177600  173560          BIC     #177600,TEMPCH  ;MASK UNWANTED BITS
005120  026727  173554  000003          CMP     TEMPCH,#3       ;CHARACTER = CONTROL-C?
005126  001013                         BNE     21$             ;CONTINUE IF NOT
005130  026727  173502  000024          CMP     RTNNO,#24       ;TEST 24?
005136  001007                         BNE     21$             ;CONTINUE IF NOT
005140  012700  000036          20$:    MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
005144  104010                         DELAY
```

```
30400 005146 104412                      CRLF                ;SEND CR-LF
30500 005150 022626                      POPSP2              ;RESET STACK
30600 005152 000167 005650               JMP     EO24B       ;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$:   MOV     #1,CNTLSW   ;CLEAR LOOP AND SEQUENCE BITS
31100 005176 000167 174660               JMP     TTYIB       ;GO WAIT FOR NEXT TEST
31200 005202 010046                23$:   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
```



```
                                        ;**********
                                        ;AT6--  TEST#46--TESTS THE ABILITY TO SET AND CLEAR
                                        ;       TRANSMITTER INTERRUPT ENABLE BIT.
                                        ;**********
005604  000046                  AT6:    46                      ;TEST NUMBER
005606  005674                          AT7                     ;NEXT TEST
005610  000012                          10.                     ;ITERATION COUNT
005612  005626                          1$                      ;SCOPE ENTRY
005614  012746  000340                  MOV     #PRTY7,-(SP)    ;SET PRIORITY TO 7
005620  012746  005626                  MOV     #1$,-(SP)
005624  000002                          RTI
005626  052777  000100  172762  1$:     BIS     #BIT6,@TPS      ;SET INTERRUPT ENABLE BIT
005634  032777  000100  172754          BIT     #BIT6,@TPS      ;CHECK THAT BIT IS SET
005642  001002                          BNE     2$              ;BRANCH IF SET
005644  104001                          ERROR                   ;NOT SET, ERROR
005646  000410                          BR      3$              ;CHAIN TO NEXT TEST
005650  042777  000100  172740  2$:     BIC     #BIT6,@TPS      ;CLEAR INTERRUPT ENABLE BIT
005656  032777  000100  172732          BIT     #BIT6,@TPS      ;CHECK IF BIT IS CLEARED
005664  001401                          BEQ     3$              ;BRANCH IF CLEARED
005666  104001                          ERROR                   ;NOT CLEARED, ERROR
005670  104005                  3$:     CHAIN                   ;CHAIN TO NEXT TEST
005672  000755                          BR      1$              ;DO AGAIN

                                        ;**********
                                        ;AT7--  TEST #47--TESTS THE ABILITY TO CLEAR TRANSMITTER
                                        ;       INTERRUPT ENABLE BIT WITH RESET INSTRUCTION.
                                        ;**********
005674  000047                  AT7:    47                      ;TEST NUMBER
005676  005744                          AT10                    ;NEXT TEST
005700  000012                          10.                     ;ITERATION COUNT
005702  005716                          1$                      ;SCOPE ENTRY
005704  012746  000340                  MOV     #PRTY7,-(SP)    ;SET PRIORITY TO 7
005710  012746  005716                  MOV     #1$,-(SP)
005714  000002                          RTI
005716  052777  000100  172672  1$:     BIS     #BIT6,@TPS      ;SET INTERRUPT BIT
005724  000005                          RESET                   ;RESET
005726  032777  000100  172662          BIT     #BIT6,@TPS      ;CHECK IF BIT IS CLEARED
005734  001401                          BEQ     2$              ;BRANCH IF CLEARED
005736  104001                          ERROR                   ;ERROR, RESET DID NOT CLEAR BIT
005740  104005                  2$:     CHAIN                   ;CHAIN TO NEXT ROUTINE
005742  000765                          BR      1$              ;REPEAT TEST
```

```
                                        ;**********
                                        ;AT10-- TEST #50--CHECKS THAT RESET SETS THE TRANSMITTER
                                        ;       READY BIT AND THAT THE READY BIT CAN BE READ RELIABLY.
                                        ;**********

005744  000050                  AT10:   50                      ;TEST NUMBER
005746  006002                          AT11                    ;NEXT TEST
005750  000012                          10.                     ;ITERATION COUNT
005752  005754                          1$                      ;SCOPE ENTRY
005754  032777  001000  172732    1$:   BIT     #LSI11,@SR      ;SKIP TEST IF AN LSI-11
005762  001005                          BNE     2$
005764  000005                          RESET                   ;RESET
005766  105777  172624                  TSTB    @TPS            ;CHECK TRANSMIT READY BIT
005772  100401                          BMI     2$              ;BRANCH IF SET
005774  104001                          ERROR                   ;ERROR, RESET DID NOT SET READY BIT
005776  104005                  2$:     CHAIN                   ;CHAIN TO NEXT TEST
006000  000765                          BR      1$              ;DO AGAIN

                                        ;**********
                                        ;AT11-- TEST #51--TESTS THAT THE TRANSMITTER READY RESETS
                                        ;       BY LOADING THE TRANSMITTER BUFFER.
                                        ;**********

006002  000051                  AT11:   51                      ;TEST NUMBER
006004  006042                          AT12                    ;NEXT TEST
006006  000012                          10.                     ;ITERATION COUNT
006010  006012                          1$                      ;SCOPE ENTRY
006012  012700  000226          1$:     MOV     #226,R0
006016  104010                          DELAY                   ;DELAY 150 MSEC.
006020  000005                          RESET                   ;RESET
006022  005077  172572                  CLR     @TPB            ;LOAD TRANSMITTER BUFFER
006026  105777  172564                  TSTB    @TPS            ;CHECK TRANSMIT READY BIT
006032  100001                          BPL     2$              ;BRANCH IF CLEARED
006034  104001                          ERROR                   ;NOT CLEARED, ERROR
006036  104005                  2$:     CHAIN                   ;CHAIN TO NEXT TEST
006040  000764                          BR      1$              ;REPEAT TEST
```



```
                                        ;**********
                                        ;AT12-- TEST #52--CHECKS THAT THE TRANSMIT READY BIT CAN
                                        ;       CAUSE AN INTERRUPT
                                        ;**********

006042  000052                  AT12:   52                      ;TEST NUMBER
006044  006116                          AT13                    ;NEXT TEST
006046  000012                          10.                     ;ITERATION COUNT
006050  006056                          1$                      ;SCOPE ENTRY
006052  104004                          STPCHV                  ;SET UP TRANSMITTER INTERRUPT VECTOR
006054  006112                          4$                      ;TO 4$
006056  000005          1$:             RESET                   ;SEE CHAINV COMMENT
006060  005077  172532                  CLR     @TPS            ;DISABLE TRANSMIT INTERRUPT
006064  005046                          CLR     -(SP)           ;SET PRIORITY TO ZERO
006066  012746  006074                  MOV     #2$,-(SP)
006072  000002                          RTI
006074  052777  000100  172514  2$:     BIS     #BIT6,@TPS      ;ENABLE TRANSMIT INTERRUPT
006102  000240                          NOP
006104  104001                          ERROR                   ;TRANSMIT READY DID NOT CAUSE INTERRUPT
006106  104005                  3$:     CHAIN                   ;CHAIN TO NEXT TEST
006110  000762                          BR      1$              ;REPEAT TEST
006112  022626                  4$:     POPSP2                  ;INTERRUPT OCCURRED, CLEAN STACK
006114  000774                          BR      3$              ;CHAIN TO NEXT TEST

                                        ;**********
                                        ;AT13-- TEST#53--TESTS THAT THE TRANSMIT READY DOES NOT CAUSE AN
                                        ;       INTERRUPT WHEN THE PROCESSOR IS AT THE SAME LEVEL
                                        ;**********

006116  000035                  AT13:   35                      ;TEST NUMBER
006120  006176                          AT14                    ;NEXT TEST
006122  000012                          10.                     ;ITERATION COUNT
006124  006132                          1$                      ;SCOPE ENTRY
006126  104004                          STPCHV                  ;SET UP TRANSMIT INTERRUPT
006130  006170                          4$                      ;VECTOR TO 4$
006132  016746  172472          1$:     MOV     TPLVL,-(SP)     ;SET PROCESSOR TO SAME LEVEL AS XMITTER
006136  012746  006144                  MOV     #2$,-(SP)
006142  000002                          RTI
006144  005077  172446          2$:     CLR     @TPS            ;DISABLE TRANSMITTER INTERRUPTS
006150  052777  000100  172440          BIS     #BIT6,@TPS      ;ENABLE TRANSMITTER INTERRUPTS
006156  000240                          NOP
006160  005077  172432          3$:     CLR     @TPS            ;OK, NO INTERRUPT OCCURRED
006164  104005                          CHAIN                   ;CHAIN TO NEXT TEST
006166  000761                          BR      1$              ;REPEAT TEST
006170  022626                  4$:     POPSP2                  ;INTERRUPT OCCURRED,ERROR,CLEAN
006172  104001                          ERROR                   ;UP STACK
006174  000771                          BR      3$              ;CHAIN TO NEXT TEST
```

```
                                ;**********
                                ;AT14-- TEST#54--TESTS THAT THE TRANSMIT READY DOES CAUSE AN
                                ;       INTERRUPT WHEN THE PROCESSOR IS AT A PRIORITY LEVEL
                                ;       ONE LOWER THAN THE TRANSMIT INTERRUPT REQUEST LEVEL
                                ;**********

006176  000054                  AT14:   54                      ;TEST NUMBER
006200  006262                          AT15                    ;NEXT TEST
006202  000012                          10.                     ;ITERATION COUNT
006204  006212                          1$                      ;SCOPE ENTRY
006206  104004                          STPCHV                  ;SET UP TRANSMIT INTERRUPT
006210  006250                          3$                      ;VECTOR TO 3$
006212  005077  172400          1$:     CLR     @TPS            ;DISABLE TRANSMIT INTERRUPTS
006216  016746  172406                  MOV     TPLVL,-(SP)     ;SET PROCESSOR PRIORITY ONE
006222  162716  000040                  SUB     #40,(SP)        ;LEVEL LOWER THAN TRANSMITTER
006226  012746  006234                  MOV     #2$,-(SP)
006232  000002                          RTI
006234  052777  000100  172354  2$:     BIS     #BIT6,@TPS      ;ENABLE TRANSMITTER INTERRUPTS
006242  000240                          NOP
006244  104001                          ERROR                   ;NO INTERRUPT, ERROR
006246  000401                          BR      4$              ;CHAIN TO NEXT TEST
006250  062626          3$:     POPSP2                          ;INTERRUPT OCCURRED, OK, CLEAN STACK
006252  005077  172340          4$:     CLR     @TPS            ;DISABLE TRANSMITTER INTERRUPTS
006256  104005                          CHAIN                   ;CHAIN TO NEXT TEST
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
```

```
33300                                   ;**********
33400                                   ;AT17-- TEST#57--CHECKS THAT REFERENCING THE RECEIVER BUFFER
33500                                   ;       CLEARS THE DONE BIT.
33600                                   ;**********
33700
33800  006430  000057                  AT17:   57                      ;TEST NUMBER
33900  006432  006500                          AT20                    ;NEXT TEST
34000  006434  000012                          10.                     ;ITERATION COUNT
34100  006436  006446                          1$                      ;SCOPE ENTRY
34200  006440  032777  001000  172246  1$:     BIT     #LSI11,@SR      ;CHECK FOR LSI-11
34300  006446  001012                          BNE     3$              ;SKIP TEST IF SET
34400  006450  012700  000226                  MOV     #226,R0
34500  006454  104010                          DELAY                   ;DELAY 150 MSEC.
34600  006456  104021                  2$:     AREAD                   ;ENABLE RECEIVER
34700  006460  105777  172130                  TSTB    @TKB            ;REFERENCE RECEIVER BUFFER
34800  006464  105777  172122                  TSTB    @TKS            ;TEST DONE BIT
34900  006470  100001                          BPL     3$              ;BRANCH IF NOT SET
35000  006472  104001                          ERROR                   ;DONE BIT IS SET, ERROR
35100  006474  104005                  3$:     CHAIN                   ;CHAIN TO NEXT TEST
35200  006476  000760                          BR      1$              ;REPEAT TEST
35300
35400                                   ;**********
35500                                   ;AT20-- TEST#60--CHECK THAT THE RECEIVER DONE BIT IS ABLE TO
35600                                   ;       CAUSE AN INTERRUPT.
35700                                   ;**********
35800
35900  006500  000060                  AT20:   60                      ;TEST NUMBER
36000  006502  006572                          AT21                    ;NEXT TEST
36100  006504  000012                          10.                     ;ITERATION COUNT
36200  006506  006514                          1$                      ;SCOPE ENTRY
36300  006510  104003                          STRDRV                  ;SET UP RECEIVER INTERRUPT
36400  006512  006564                          4$                      ;VECTOR TO 4$
36500  006514  032777  001000  172172  1$:     BIT     #LSI11,@SR      ;CHECK FOR LSI-11
36600  006522  001021                          BNE     5$              ;SKIP TEST IF SET
36700  006524  012700  000226                  MOV     #226,R0
36800  006530  104010                          DELAY                   ;DELAY 150 MSEC
36900  006532  104021                          AREAD                   ;ENABLE RECEIVER
37000  006534  005077  172052          2$:     CLR     @TKS            ;DISABLE RECEIVER INTERRUPTS
37100  006540  005046                          CLR     -(SP)           ;SET PROCESS STATUS TO ZERO
37200  006542  012746  006550                  MOV     #3$,-(SP)
37300  006546  000002                          RTI
37400  006550  052777  000100  172034  3$:     BIS     #BIT6,@TKS      ;ENABLE RECEIVER INTERRUPT
37500  006556  000240                          NOP
37600  006560  104001                          ERROR                   ;ERROR,RECEIVER FAILED TO INTERRUPT
37700  006562  000401                          BR      5$              ;CHAIN TO NEXT TEST
37800  006564  022626                  4$:     POPSP2                  ;OK, CLEAN STACK
37900  006566  104005                  5$:     CHAIN                   ;CHAIN TO NEXT TEST
38000  006570  000751                          BR      1$              ;REPEAT TEST
```



```
38200                                   ;**********
38300                                   ;AT21-- TEST#61--TESTS THAT THE RECEIVER DONE DOES NOT CAUSE AN
38400                                   ;       INTERRUPT WHEN THE PROCESSOR IS AT THE SAME LEVEL AS
38500                                   ;       THE RECEIVER'S INTERRUPT REQUEST LEVEL.
38600                                   ;**********
38700
38800  006572  000061                  AT21:   61                      ;TEST NUMBER
38900  006574  006672                          AT22                    ;NEXT TEST
39000  006576  000012                          10.                     ;ITERATION COUNT
39100  006600  006606                          1$                      ;SCOPE ENTRY
39200  006602  104003                          STRDRV                  ;SET RECEIVER VECTOR TO 5$
39300  006604  006664                          5$
39400  006606  032777  001000  172100  1$:     BIT     #LSI11,@SR      ;CHECK FOR LSI-11
39500  006614  001017                          BNE     4$              ;SKIP TEST IF SET
39600  006616  012700  000226                  MOV     #226,R0
39700  006622  104010                          DELAY                   ;DELAY 150 MSEC
39800  006624  104021                          AREAD                   ;ENABLE RECEIVER
39900  006626  005077  171760          2$:     CLR     @TKS            ;DISABLE RECEIVER INTERRUPTS
40000  006632  016746  171766                  MOV     @TKLVL,-(SP)    ;SET PROCESSOR PRIORITY TO SAME LEVEL AS RECEIVER
40100  006636  012746  006644                  MOV     #3$,-(SP)
40200  006642  000002                          RTI
40300  006644  052777  000100  171740  3$:     BIS     #BIT6,@TKS      ;ENABLE RECEIVER INTERRUPTS
40400  006652  000240                          NOP
40500  006654  005077  171732          4$:     CLR     @TKS            ;OK, NO INTERRUPT OCCURRED
40600  006660  104005                          CHAIN                   ;CHAIN TO NEXT TEST
40700  006662  000751                          BR      1$              ;REPEAT TEST
40800  006664  022626                  5$:     POPSP2                  ;ERROR, RECEIVER INTERRUPTED, CLEAN STACK
40900  006666  104001                          ERROR
41000  006670  000771                          BR      4$              ;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  007100                          AT23                    ;NEXT TEST
006676  000012                          10.                     ;ITERATION COUNT
006700  006706                          1$                      ;SCOPE ENTRY
006702  104003                          SIRDRV                  ;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
                                        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$:     SUB     #40,PSW
006752  052777  000100  171632          BIS     #BIT6,@TKS      ;ENABLE INTERRUPTS
006760  000240                          NOP
006762  104001                          ERROR                   ;FAILED TO INTERRUPT
006764  000401                          BR      5$              ;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$:     MOV     #226,R0
007024  104010                          DELAY                   ;DELAY 150 MSEC
007026  104021                          AREAD                   ;ENABLE RECEIVER
007030  104003                          SIRDRV                  ;SET RECEIVER INTERRUPT
007032  007064                          4$                      ;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
```

SEQ 0090

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


SEQ 0091

```
                                        ;**********
                                        ;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
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                  JSP     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
```

```
                                        ;XXXXXXXXXX
                                        ;
                                        ;PT2 -- NON-PRINTING CHARACTER TEST.  THIS TEST
                                        ;       PRINTS THE OCTAL CODE FOLLOWED BY THE MNEMONIC
                                        ;       OF ALL NON-PRINTING CHARACTERS.  FOLLOWING EACH
                                        ;       MNEMONIC, THE PRINTER IS DRIVEN BY THE NON-PRINTING
                                        ;       CODE (000 THROUGH 037 PLUS 177)
                                        ;       ALL CONTROL CHARACTERS (INCLUDING THOSE FOR OPTIONS
                                        ;       WILL BE SKIPPED, REFER TO THE DOCUMENT FOR A LIST OF THOSE
                                        ;       TESTED.
                                        ;
                                        ;XXXXXXXXXX
                                        ;
 007570  000002                         PT2:    2                       ;TEST NUMBER
 007572  010164                                 PT3                     ;NEXT TEST
 007574  104416                                 PRTHDR                  ;PRINT TEST HEADER
 007576  012701  007676                 1$:     MOV     #IDEZ,R1        ;ADDR OF IDENT TO R1
 007602  012703  010137                         MOV     #NPCODE,R3      ;ADDR OF NON-PRINT-CODES TO R3
 007606  012702  000003                 2$:     MOV     #3,R2           ;NO. OF ID'S PER LINE TO R2
 007612  012704  000010                 3$:     MOV     #10,R4          ;NO. OF CHARS PER ID TO R4
 007616  121327  000055                 4$:     CMPB    (R3),#55        ;ZERO TERMINATOR IN NP TABLE?
 007622  001422                                 BEQ     7$              ;BRANCH IF YES
 007624  112100                                 MOVB    (R1)+,R0        ;GET ID CHARACTERS
 007626  104015                                 PRINTC                  ;AND PRINT A
 007630  005304                                 DEC     R4              ;GROUP OF
 007632  001371                                 BNE     4$              ;8 CHARACTERS
 007634  112300                                 MOVB    (R3)+,R0        ;GET NP CODE FROM TABLE
 007636  012704  000003                         MOV     #3,R4           ;AND
 007642  104015                         5$:     PRINTC                  ;TRY TO PRINT IT
 007644  005304                                 DEC     R4              ;THREE
 007646  001375                                 BNE     5$              ;TIMES
 007650  005302                                 DEC     R2              ;MORE TO GO ON THIS LINE ?
 007652  001404                                 BEQ     6$              ;BRANCH IF NO
 007654  004767  177672                         JSR     PC,SP2          ;SEND 3 SPACES
 007660  104015                                 PRINTC
 007662  000753                                 BR      3$              ;BRANCH TO CONTINUE LINE
 007664  104012                         6$:     CRLF
 007666  000747                                 BR      2$              ;GO DO NEXT LINE
 007670  104012                         7$:     CRLF
 007672  104005                                 CHAIN                   ;CHAIN TO NEXT TEST
 007674  000740                                 BR      1$
                                        ;
                                        ;
                                        ;
 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
 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
 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
 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
 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
 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
 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
 010137      000     002     006        NPCODE: .BYTE   0,2,6,20,21,22,23,24
 010142      020     021     022
 010145      023     024
 010147      025     025     027                .BYTE   25,25,27,30,31,32,34,35
 010152      030     031     032
 010155      034     035
 010157      036     037     177                .BYTE   36,37,177,55
 010162      055
                                                .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  104416                                  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
```



```
                                        ;XXXXXXXXXX
                                        ;
                                        ;PT4 -- MULTIPLE LINE FEED TEST -- 63 LINE FEEDS ARE
                                        ;       SENT WITH A REFERENCE LINE AT THE START AND END.
                                        ;       A NUMBER IS PRINTED WHICH INDICATES THE NUMBER OF LINE
                                        ;       FEEDS THAT WILL BE ISSUED BEFORE THE NEXT
                                        ;       NUMBER OR REFERENCE LINE IS PRINTED.
                                        ;
                                        ;XXXXXXXXXX
010304  000004                          PT4:    4                       ;TEST NUMBER
010306  010462                                  PT5                     ;NEXT TEST
010310  104016                                  PRTHDR                  ;TYPE HEADER
010312  012767  000001  170366          1$:     MOV     #1,LFCNT        ;LINE FEED COUNT TO 1
010320  016701  170326                          MOV     WIDTH,R1        ;COLUMN COUNT TO R1
010324  012702  010444                          MOV     #LINE3,R2       ;ADDR OF NUMBER FIELD TO R2
010330  004767  000060                          JSR     PC,REF          ;PRINT REFERENCE LINE
010334  016701  170346                  2$:     MOV     LFCNT,R1        ;LINE FEED COUNT TO R1
010340  104014                          3$:     LF                      ;SEND LF
010342  005301                                  DEC     R1              ;DECREMENT COUNTER
010344  001375                                  BNE     3$              ;BRANCH IF NOT YET 0
010346  006367  170334                          ASL     LFCNT           ;DOUBLE LINE FEED COUNT
010352  022767  000100  170326                  CMP     #BIT6,LFCNT     ;TEST IF COUNT IS 32
010360  001406                                  BEQ     4$              ;BRANCH IF =32, END
010362  112200                                  MOVB    (R2)+,R0        ;NUMBER TO R0
010364  104015                                  PRINTC                  ;PRINT IT
010366  112200                                  MOVB    (R2)+,R0        ;NUMBER TO R0
010370  104015                                  PRINTC                  ;PRINT IT
010372  104022                                  CR                      ;PRINT CR
010374  000757                                  BR      2$              ;DRIVE THE LINEFEEDS
010376  016701  170250                  4$:     MOV     WIDTH,R1        ;COLUMN COUNT TO R1
010402  004767  000006                          JSR     PC,REF          ;SEND END REFERENCE LINE
010406  104014                                  LF                      ;ADVANCE PAPER
010410  104005                                  CHAIN
010412  000737                                  BR      1$              ;REPEAT TEST
010414  112200                          REF:    MOVB    (R2)+,R0        ;NUMBER TO R0
010416  104015                                  PRINTC                  ;PRINT IT
010420  112200                                  MOVB    (R2)+,R0        ;NUMBER TO R0
010422  104015                                  PRINTC                  ;PRINT IT
010424  005741                                  TST     -(R1)           ;DECREASE COUNTER BY 2
010426  012700  000137                          MOV     #137,R0         ;DASH (-) TO R0
010432  104015                          1$:     PRINTC                  ;PRINT IT
010434  005301                                  DEC     R1              ;DECREMENT COLUMN COUNTER
010436  001375                                  BNE     1$              ;BRANCH IF NO ZERO
010440  104022                                  CR                      ;PRINT CR
010442  000207                                  RTS     PC              ;RETURN
                                        ;
010444  060     061     060             LINE3:  .ASCII  /0102040816320 0/
010447  062     060     064
010452  060     070     061
010455  066     063     062
010460  060     060
```

SEQ 0100

```
                                ;XXXXXXXXXX
                                ;PT5--  SINGLE LINE FEED TEST --  TESTS THE LINE FEED
                                ;       CAPABILITY FROM ALL COLUMNS.
                                ;XXXXXXXXXX
                                PT5:    5                       ;TEST NUMBER
                                        PT6                     ;NEXT TEST
                                        PRTHDR                  ;TYPE HEADER
010470 016701 170156            1$:     MOV     WIDTH,R1        ;COLUMN COUNT TO R1
010474 005741                           TST     -(R1)           ;DECREASE BY 2
010476 012700 000060                    MOV     #60,R0          ;"0" TO R0
010502 104015                   2$:     PRINTC                  ;SEND 0
010504 005301                           DEC     R1              ;DECREMENT COLUMN COUNTER
010506 001375                           BNE     2$              ;BRANCH IF NOT ZERO
010510 012700 000062                    MOV     #62,R0          ;SEND A 2
010514 104015                           PRINTC
010516 104015                           PRINTC                  ;SEND A SECOND TWO
010520 026727 170126 000204             CMP     WIDTH,#132.     ;COMPARE COLUMN COUNT
010526 001404                           BEQ     3$              ;BRANCH IF EQ 132
010530 012700 003410                    MOV     #3410,R0        ;DELAY 1.8 SEC
010534 104010                           DELAY
010536 000407                           BR      5$
010540 012700 000063            3$:     MOV     #"3,R0          ;3'S TO R0
010544 012701 000100                    MOV     #100,R1         ;64 TO COUNTER
010550 104015                   4$:     PRINTC                  ;SEND CHARACTER
010552 005301                           DEC     R1              ;DECREMENT COUNT
010554 001375                           BNE     4$              ;BRANCH IF NOT ZERO
010556 104012                   5$:     CRLF                    ;SEND A CR,LF
010560 016701 170066                    MOV     WIDTH,R1        ;NO. COLUMNS TO R1
010564 012700 000134            6$:     MOV     #134,R0         ;BACKSLASH TO R0
010570 104015                           PRINTC                  ;SEND IT
010572 104014                           LF                      ;PRINT LF
010574 005301                           DEC     R1              ;DECREMENT COUNTER
010576 001372                           BNE     6$              ;BRANCH IF NOT ZERO.
010600 104022                           CR                      ;SEND CR
010602 004767 000022                    JSR     PC,PT5AL        ;SEND REF LINE #1
010606 104012                           CRLF                    ;SEND A CR,LF
010610 012700 001750                    MOV     #1750,R0        ;DELAY 1 SEC
010614 104010                           DELAY
010615 004767 000006                    JSR     PC,PT5AL        ;SEND A SECOND REF. LINE
010622 104012                           CRLF                    ;SEND A CR,LF
010624 104005                           CHAIN                   ;CHAIN TO NEXT TEST
010626 000720                           BR      1$              ;REPEAT TEST
010630 016701 170016            PT5AL:  MOV     WIDTH,R1        ;COLUMN COUNT TO R1
010634 012700 000061                    MOV     #61,R0          ;"1" TO R0
010640 104015                   1$:     PRINTC                  ;PRINT R0
010642 005301                           DEC     R1              ;DECREMENT COUNTER
010644 001407                           BEQ     2$              ;BRANCH IF=0
010646 005200                           INC     R0              ;INCREMENT CHARACTER
010650 020027 000071                    CMP     R0,#71          ;COMP CHAR TO "9"
010654 101771                           BLOS    1$              ;BRANCH IF LOWER OR SAME
010656 012700 000060                    MOV     #60,R0          ;RESET CHAR TO "0"
010662 000766                           BR      1$              ;CONTINUE
010664 000207                   2$:     RTS     PC              ;FINISHED, RETURN TO CALLER
```


SEQ 0101

```
                                ;XXXXXXXXXX
                                ;PT6--  BACKSPACE TEST -- A REFERENCE LINE SUCH AS IN
                                ;       TEST PT5 IS PRINTED.  THE SECOND LINE CONSISTS
                                ;       OF PRINTING A BACKSLASH, BACKSPACE AND FORWARD
                                ;       SLASH COMBINATION OUT TO THE GIVEN COLUMN WIDTH.
                                ;       THIS LINE IS THEN FOLLOWED BY THE SAME TWO REFERENCE
                                ;       LINES AS PRINTED IN TEST PT5.
                                ;XXXXXXXXXX
010666 000006                   PT6:    6                       ;TEST NUMBER
010670 011054                           PT7                     ;NEXT TEST
010672 104016                           PRTHDR                  ;PRINT HEADER
010674 104007                           TYPEM                   ;PRINT COLUMN # MESG
010676 014127                           HDR0
010700 016701 167746            1$:     MOV     WIDTH,R1        ;COLUMN COUNT TO R1
010704 005741                           TST     -(R1)           ;DECREMENT BY 2
010706 012700 000060                    MOV     #60,R0          ;"0" TO R0
010712 104015                   2$:     PRINTC                  ;SEND 0
010714 005301                           DEC     R1              ;DECREMENT COLUMN COUNTER
010716 001375                           BNE     2$              ;BRANCH IF NOT ZERO
010720 012700 000062                    MOV     #62,R0          ;"2" TO R0
010724 104015                           PRINTC
010726 104015                           PRINTC                  ;SEND A "2"
010730 026727 167716 000204             CMP     WIDTH,#132.     ;SEND A SECOND "2"
010736 001404                           BEQ     3$              ;COMPARE COLUMN COUNT
010740 012700 003410                    MOV     #3410,R0        ;DELAY 1.8 SEC
010744 104010                           DELAY
010746 000407                           BR      5$
010750 012700 000063            3$:     MOV     #63,R0          ;3'S TO R0
010754 012701 000100                    MOV     #100,R1         ;64 TO CHAR COUNT
010760 104015                   4$:     PRINTC                  ;SEND CHAR
010762 005301                           DEC     R1              ;DECREMENT CHAR COUNT
010764 001375                           BNE     4$              ;CONTINUE IF NOT DONE
010766 104012                   5$:     CRLF                    ;SEND A CR,LF
010770 016701 167656                    MOV     WIDTH,R1        ;COLUMN COUNT TO R1
010774 012700 000134            6$:     MOV     #134,R0         ;BACKSLASH TO R0
011000 104015                           PRINTC                  ;SEND IT
011002 012700 000010                    MOV     #10,R0          ;BACKSPACE TO R0
011006 104015                           PRINTC                  ;SEND IT
011010 012700 000057                    MOV     #57,R0          ;FORWORD SLASH TO R0
011014 104015                           PRINTC                  ;SEND IT
011016 005301                           DEC     R1              ;END OF PAPER
011020 001365                           BNE     6$              ;BRANCH IF NO
011022 104014                           LF                      ;SEND LF
011024 104022                           CR                      ;SEND CR
011026 004767 177576                    JSR     PC,PT5AL        ;SEND REF LINE #1
011032 104012                           CRLF                    ;SEND A CR,LF
011034 012700 001750                    MOV     #1750,R0        ;DELAY 1 SEC
011040 104010                           DELAY
011042 004767 177562                    JSR     PC,PT5AL        ;SEND SECOND REF LINE
011046 104012                           CRLF                    ;SEND A CR,LF
011050 104005                           CHAIN                   ;CHAIN TO NEXT TEST
011052 000712                           BR      1$              ;REPEAT TEST
```

```
                                        ;XXXXXXXXXX
                                        ;
                                        ;PT7--  OVERPRINT TEST-- A ROW OF ALTERNATING M'S AND
                                        ;       SPACES ARE PRINTED, OUT TO THE LAST COLUMN AND OVERPRINTED TWICE.
                                        ;       A SECOND LINE OF ALTERNATING SPACES AND "@'S" IS THEN
                                        ;       SENT 3 TIMES AS THE FIRST LINE.  THIS IS FOLLOWED
                                        ;       BY A THIRD AND FINAL LINE OF ALTERNATING "&"
                                        ;       AND SPACES.
                                        ;
                                        ;XXXXXXXXXX

011054  000007                  PT7:    7                       ;TEST NUMBER
011056  011266                          PT10                    ;NEXT TEST
011060  104416                          PRTHDR                  ;PRINT MESSAGE
011062  012703  000002          1$:     MOV     #2,R3           ;2 COUNT TO R3
011066  016701  167560          2$:     MOV     WIDTH,R1        ;NO. OF COLUMNS TO R1
011072  012700  000115          3$:     MOV     #115,R0         ;"M" TO R0
011076  104015                          PRINTC                  ;SEND IT
011100  005301                          DEC     R1              ;END OF LINE
011102  001404                          BEQ     4$              ;BRANCH IF YES
011104  004767  176450                  JSR     PC,SPC          ;SEND SPACE
011110  005301                          DEC     R1              ;END OF LINE?
011112  001367                          BNE     3$              ;BRANCH IF NO
011114  022703  000002          4$:     CMP     #2,R3           ;TEST R3
011120  001003                          BNE     6$              ;BRANCH IF NOT FIRST TIME
011122  104022                  5$:     CR                      ;SEND CR
011124  005303                          DEC     R3              ;DECREASE LINE COUNTER
011126  000757                          BR      2$              ;REPEAT LINE
011130  005703                  6$:     TST     R3              ;THIRD TIME?
011132  001373                          BNE     5$              ;BRANCH IF NOT
011134  104012                          CRLF                    ;NEXT LINE
011136  005723                          TST     (R3)+           ;REPEAT COUNTER TO R3
011140  016701  167506          7$:     MOV     WIDTH,R1        ;COLUMN COUNT TO R1
011144  004767  176410          8$:     JSR     PC,SPC          ;SEND SPACE
011150  005301                          DEC     R1              ;DECREASE COLUMN COUNT
011152  001405                          BEQ     9$              ;BRANCH IF 0, END OF LINE
011154  012700  000100                  MOV     #100,R0         ;"@" TO R0
011160  104015                          PRINTC                  ;SEND IT
011162  005301                          DEC     R1              ;DECREASE COLUMN COUNT
011164  001367                          BNE     8$              ;BRANCH IF NOT 0 (NOT END)
011166  022703  000002          9$:     CMP     #2,R3           ;END OF LINE, FIRST TIME?
011172  001003                          BNE     11$             ;BRANCH IF NOT
011174  104022                  10$:    CR                      ;SEND CR
011176  005303                          DEC     R3              ;DECREASE LINE COUNTER
011200  000757                          BR      7$              ;REPEAT LINE
011202  005703                  11$:    TST     R3              ;TEST IF THIRD REPEAT
011204  001373                          BNE     10$             ;BRANCH IF NOT
011206  104012                          CRLF                    ;DO NEXT LINE
011210  005723                          TST     (R3)+           ;LINE REPEAT COUNTER TO R3
011212  016701  167434          12$:    MOV     WIDTH,R1        ;COLUMN COUNT TO R1
011216  012700  000046          13$:    MOV     #46,R0          ;"&" TO R0
011222  104015                          PRINTC                  ;SEND IT
011224  005301                          DEC     R1              ;DECREASE COLUMN COUNT

011226  001404                          BEQ     14$             ;BRANCH IF END
011230  004767  176324                  JSR     PC,SPC          ;SEND SPACE
011234  005301                          DEC     R1              ;DECREASE COLUMN COUNT
```



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

SEQ 0104

```
                                        ;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$:     MOV     #36,R1          ;SET R1=30
011300  012702  000120                          MOV     #120.,R2        ;SET CHAR COUNT = 120
011304  012767  000036  000010                  MOV     #30.,3$+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
```


SEQ 0105

```
                                        ;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                                  PTO                     ;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
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
```



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

```
 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  166504                  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
```

SEQ 0110

```
                                        .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$:     TYPEM                   ;PRINT TERMINATION MESSAGE
                                        ECOEND
012160  014272                          CHAIN
012162  104005                          BR      1$              ;CHAIN TO NEXT TEST
012164  000757                                                  ;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$
```


SEQ 0111

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

```
                                        ;**********
                                        ;
                                        ;       THIS FOLLOWING TABLE IS USED BY TEST E023
                                        ;
                                        ;**********
012272  116     125     114     MONIC:  .ASCII  /NUL /
012275  040
012276  123     117     110             .ASCII  /SOH /
012301  040
012302  123     124     130             .ASCII  /STX /
012305  040
012306  105     124     130             .ASCII  /ETX /
012311  040
012312  105     117     124             .ASCII  /EOT /
012315  040
012316  105     116     121             .ASCII  /ENQ /
012321  040
012322  101     103     113             .ASCII  /ACK /
012325  040
012326  102     105     114             .ASCII  /BEL /
012331  040
012332  102     123     040             .ASCII  /BS  /
012335  040
012336  110     124     040             .ASCII  /HT  /
012341  040
012342  114     106     040             .ASCII  /LF  /
012345  040
012346  126     124     040             .ASCII  /VT  /
012351  040
012352  106     106     040             .ASCII  /FF  /
012355  040
012356  103     122     040             .ASCII  /CR  /
012361  040
012362  123     117     040             .ASCII  /SO  /
012365  040
012366  123     111     040             .ASCII  /SI  /
012371  040
012372  104     114     105             .ASCII  /DLE /
012375  040
012376  104     103     061             .ASCII  /DC1 /
012401  040
012402  104     103     062             .ASCII  /DC2 /
012405  040
012406  104     103     063             .ASCII  /DC3 /
012411  040
012412  104     103     064             .ASCII  /DC4 /
012415  040
012416  116     101     113             .ASCII  /NAK /
012421  040
012422  123     131     116             .ASCII  /SYN /
012425  040
012426  105     124     102             .ASCII  /ETB /
012431  040
012432  103     101     116             .ASCII  /CAN /
012435  040
012436  105     115     040             .ASCII  /EM  /
```



```
012441  040
012442  123     125     102             .ASCII  /SUB /
012445  040
012446  105     123     103             .ASCII  /ESC /
012451  040
012452  106     123     040             .ASCII  /FS  /
012455  040
012456  107     123     040             .ASCII  /GS  /
012461  040
012462  122     123     040             .ASCII  /RS  /
012465  040
012466  125     123     040             .ASCII  /US  /
012471  040
012472  123     120     040             .ASCII  /SP  /
012475  040

                                        .EVEN
```

SEQ 0114

```
                                        ;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                  JSP     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
```


SEQ 0115

```
012716  006267  165762                  ASR     PCHAR           ;NOT THREE, SHIFT NEXT OCTAL
012722  006267  165756                  ASR     PCHAR           ;CHARACTER TO THE RIGHT
012726  006267  165752                  ASR     PCHAR           ;
012732  000760                          BR      1$              ;CONVERT AND STORE NEXT CHAR
012734  000207                  2$:     RTS     PC              ;RETURN TO CALLER
012736  012701  014327          MOVNUM: MOV     #LINE5A,R1      ;ADDR OF LINES IN R1
012742  012702  000004                  MOV     #4,R2           ;COUNT OF 4 TO R2
012746  112021                  1$:     MOVB    (R0)+,(R1)+     ;MOV 4 CHARS TO MESG AREA
012750  005302                          DEC     R2              ;DECREMENT COUNTER
012752  001375                          BNE     1$              ;BRANCH IF NOT ALL DONE
012754  105767  165722                  TSTB    PARITY          ;TEST PARITY FLAG
012760  001003                          BNE     2$              ;BRANCH IF ODD PARITY
012762  012700  014371                  MOV     #EVEN,R0        ;SET ADDRESS FOR EVEN PARITY MESG
012766  000402                          BR      3$              ;CONTINUE
012770  012700  014375          2$:     MOV     #ODD,R0         ;SET ADDRESS FOR ODD PARITY MESG
012774  012702  000004          3$:     MOV     #4,R2           ;COUNT OF 4 TO R2
013000  112021                  4$:     MOVB    (R0)+,(R1)+     ;MOVE 4 CHARS TO MESG AREA
013002  005302                          DEC     R2              ;DECREMENT COUNTER
013004  001375                          BNE     4$              ;BRANCH IF NOT DONE
013006  000207                          RTS     PC              ;RETURN
                                        ;
013010  040     040     040     MG24:   .ASCII  /   /           ;SAVE CHARACTER CODE
013013  040
                                        ;
                                        .EVEN
                                        ;
013014  104     105     114     MG25:   .ASCII  /DEL /          ;MNEMONIC FOR RUBOUT
013017  040
                                        ;
                                        .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$:     READ                    ;WAIT FOR INPUT
22100 013036  012700  000036                      MOV     #30.,R0         ;DELAY FOR HALF DUPLEX
22200 013042  104010                            DELAY
22300 013044  022767  000177  165626              CMP     #177,TEMPCH     ;TEST IF RUBOUT
22400 013052  001440                            BEQ     TERM            ;BRANCH IF RUBOUT
22500 013054  022767  000003  165616              CMP     #3,TEMPCH       ;TEST IF CNTL-C
22600 013062  001413                            BEQ     OUTPUT          ;BRANCH IF CNTL-C
22700 013064  020127  000400                      CMP     R1,#256.        ;YES, CHECK IF CHAR CNT IS EQ, GT 256
23000 013070  103361                            BHIS    1$              ;BRANCH IF YES, IGNORE CHAR
22900 013072  112722  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                                   ;XXXXXXXXXX
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                                   ;XXXXXXXXXX
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            CMP     TEMPCH,#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
```

SEQ 0118

29500

SEQ 0119

```
                                                ;
                                                .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     EO25MA: .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     EO25MB: .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             EO23M:  :ASCII  /  /
    1700        014323  040     040     040     LINE5:  :ASCII  /   /           ;MESG FOR TEST EO24
                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
```

SEQ 0122

```
ACRLF = 000200   CHAINN  001412   EO25MA  014145   PRGTAB  002522   START3  000772
ADJR4   012032   CHAINV  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   CKPDS   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   READI   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   ECOPND  014272   MONIC   012272   RESTRT  003516   TVP     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   001326   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
```