IDENTIFICATION

Product Code:	MAINDEC-9A-D2BA-D
Product Name:	PDP-9 TTY Test
Date Created:	May 1, 1967
Maintainer:	Diagnostic Group
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TABLES

1. ABSTRACT

The PDP-9 TTY Test is designed to verify the operational status of a KSR 33 or KSR 35 Teletype and associated control logic.

The program is divided into two separate parts. Part 1 tests the teleprinter control logic, the complete character set, carriage return, line feed, space, right hand margins, and a mechanical worst case. The mechanical worst-case test provides a pattern for either a Model 33 or 35 KSR. The appropriate pattern is selected by the operator with an AC switch.

Part 2 of the program tests the keyboard input control logic, character input/output, and ability to interrupt the teleprinter from the keyboard without losing the input character.

2. REQUIREMENTS

2.1 Equipment

A standard PDP-9 equipped with a Model 33 or 35 KSR Teletype.

2.2 Storage

The program requires 4510 words of core memory. Locations 00000 through 04510 are used.

2.3 Preliminary Programs

(None required.)

3. LOADING PROCEDURE

3.1 Method

The paper tape supplied is punched in HRI mode.

Place the HRI tape in the reader.

Set the ADDRESS SWITCHES to 00000.

Press I/O RESET, and then READ-IN.

At the completion of loading, the PC should equal 4465 and the MB 740040.

4. STARTING PROCEDURES

4.1 Control Switch Settings

Part 1 - ACS 2 up if a KSR 35 is being used. All other ACS down.

Part 2 - All ACS down.

4.2 Starting Addresses

Part 1 - 100

Part 2 - 2500

Starting addresses for individual tests may be found in table 2 appearing at the end of this document.

4.3 Program and Operator Action

4.3.1 Part 1 - Teleprinter Tests -

Set the ADDRESS SWITCHES to 100.

Place ACS 2 up if the PDP-9 being used is equipped with a Model 35 KSR.

Press I/O RESET, and then START.

Part 1 consists of seven tests, of which the first five test the teleprinter control logic. As one test is completed, the next is automatically started. The Mechanical Worst Case test is the last test performed in part 1, and will run until manually stopped by the operator. This portion of test 7 also provides variable speed control of the teleprinter using ACS 3 through 17. See paragraph 8.2, Applications.

4.3.2 Part 2 - Keyboard Tests -

Set the ADDRESS SWITCHES to 2500.

Place all ACS down.

Press I/O RESET, and then START.

Part 2 consists of six tests, of which the first four test the keyboard input control logic. As one test is completed, the next is automatically started. Tests 5 and 6 must be started by the operator. At the completion of test 4 a halt will occur (unless looping on tests 2 through 4) with the PC = 3221 (PRHLT2). Pressing CONTINUE will provide a header for test 5. The header may be omitted by starting test 5 from location 3300 (KTS5).

Test 6 may be started at location 3374 or 3400. Starting at location 3374 will provide a header with operating instructions. The header and instructions may be omitted by starting from location 3300 (KTS5).

5. OPERATING PROCEDURE

5.1 Operational Switch Settings

5.1.1 Part 1 - Teleprinter Control Logic Tests 1-5 -

ACS 1 (1) - 'Scope mode for current test.

ACS 2 (1) - Loop on tests 2-5.

5.1.2 Part 1 - Teleprinter Tests 6 and 7 - 7K -

ACS 0 (1) - Halt current test at location 2076.

ACS 1 (1) - Loop on current test.

ACS 2 (0) - Model 33 KSR being used.
(1) - Model 35 KSR being used.

ACS 2 is used for test 7K, Mechanical Worst Case, only.

ACS 9 (1) - Print character in ACS 10-17. Start from location 600.
- For 7G, repeat a specific line length.
- For 7H, repeat a specific number of line feeds.
- For 7I, repeat a specific number of spaces.

ACS 3-17 - Used with test 7K (Mechanical Worst Case) for variable printing speed control.

Refer to section 8.2 (Applications) for detailed operating instructions for any of the above ACS functions.

5.1.3 Part 2 - Keyboard Control Logic Tests 1-4

ACS 1 (1) - 'Scope mode for current test.

ACS 2 (1) - Loop on tests 2-4.

5.1.4 Part 2 - Keyboard Input Tests 5 and 6

ACS 0 (1) - Halt current test at location 2076.

ACS 1 (1) - Simulate keyboard buffer character shift with character specified in ACS 10-17. (See section 8.2.5).

5.2 Subroutine Abstracts - Part 1

5.2.1 Test 1 - Illegal Instruction - Test 1 first issues a CAF instruction, clears the AC, and then attempts to execute an IOT of 700400. The program then stalls for approximately 150 msec and then tests for the teleprinter flag set. The flag should be clear, and if not, an error halt occurs with the PC = 122 (E01). Press CONTINUE to re-execute the test. Test 1 is repeated 7 times. If no error occurs test 2 is executed.

5.2.2 Test 2 - Test For Flag Off - Test 2 makes sure the teleprinter flag is clear before going on to tests 3, 4, and 5. A 150 msec stall is first done, followed by a test of the teleprinter flag. If the flag has set, an error halt will occur with the PC = 205 (E02). Press CONTINUE to re-execute the test. If no error, test 3 is executed.

5.2.3 Test 3 - Set Flag With TLS - Test 3 attempts to set the teleprinter flag using the IOT TLS. A carriage return character is used for output. A TLS is first executed, followed by a 150 msec stall, after

which the teleprinter flag is tested. If the flag is not set an error halt occurs with the PC = 316 (E03). Press CONTINUE to re-execute the test. Test 3 is repeated 13 times. If no error occurs test 4 is executed.

5.2.4 Test 4 - Clear the Flag with TLS and TCF - The teleprinter flag is first set using TLS and a carriage return character for output. After the flag is set another TLS is immediately executed.

The teleprinter flag should be cleared by the second TLS. If the test is successful, the flag is again set using the same procedure as before, and then an attempt to clear the flag with TCF is executed. If successful, test 5 is executed.

If the teleprinter flag cannot be cleared using TLS, an error halt occurs with PC = 411 (E04). If TCF will not clear the flag, an error halt occurs with PC = 426 (E04A). With either error halt, press CONTINUE to re-execute the test which failed.

5.2.5 Test 5 - Interrupt Test - Test 5 first issues a CLOF IOT followed by a CAF. The program interrupt is then enabled (ION) and a 150 msec stall is done. No interrupt should occur. If an interrupt does occur, the program will determine if it was caused by the teleprinter, or by some other external device. If another device caused the interrupt, a halt occurs with PC = 536 (E05A). If the teleprinter caused the interrupt, a halt occurs with PC = 540 (E05B). At either error halt the AC will contain the I/O status word. Press CONTINUE to re-execute this portion of test 5.

If no illegal interrupt occurs, a carriage return character is used as output to cause an interrupt. After output, a 150 msec stall is done. If no interrupt occurs within this period an error halt occurs with PC = 522 (E05). Press CONTINUE to re-execute this portion of test 5.

If no errors occur test 6 is executed.

5.2.6 Test 6 - Basic Test of Complete Character Set - Test 6 prints the alphabet, digits, and punctuation on one line. Four lines are printed and then test 7 is executed.

The sequence of characters is the same for either the Model 33 or 35 Teleprinter as follows.

ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789'"#$%&'()*+,-./@:;<=> ?[ ]↑←BELL CR LF

A single character may be continuously printed by placing ACS 9 up and the desired character in ACS 10-17. Start the program from location 600. A full line of one character will be repeated, with an automatic carriage return/line feed at the end of each line. The routine may be halted by placing ACS 0 up. ACS 10-17 may be changed while the program is running.

The operator may continuously loop on test 6 by placing ACS 1 up, any time before the four lines are completed, or by restarting from location 600 with ACS 1 up.

ACS 0 in the up position will immediately halt test 6, looping or not.

5.2.7 Test 7 - Test Pairs of Characters - Test 7 tests pairs of characters starting with the alphabet, numbers, and punctuation marks. After testing the character string, tests are made on carriage return, line feed, space, right hand margins, and mechanical worst case.

Test 7 divides the character string into six groups of tests, mainly for the convenience of restarting the program at a point which tests a particular group. The six groups are designated as test 7, 7B, 7C, 7D, 7E, and 7F. Tests 7 through 7E print three pairs of characters per line, printing each pair eight times. Three lines are printed before going on to the next test. Test 7F is similar with the exception that only two pairs are printed. The format will appear as in the example below.

```
ABABABABABABABCDCDCDCDCDCDCDCDEFEFEFEFEFEFEFEF
ABABABABABABABCDCDCDCDCDCDCDCDEFEFEFEFEFEFEFEF
ABABABABABABABCDCDCDCDCDCDCDCDEFEFEFEFEFEFEFEF
```

Each of the six groups is preceded by a short header identifying the particular group. The header will be the figure 7, followed by a letter which identifies the group.

The six groups and the pairs they test are as follows:

Test 7 - Alphabet and Numbers Set - A-Z and 0-9.

7B - ! " # $ % &

7C - ' ( ) * + ,

7D - - . / @ : ;

7E - < = > ? [

7F -] ↑ ← BELL

Any pair of characters may be printed by manually placing the two characters into location 1012 (tagged TEMP), and placing ACS 9 up. The specific characters will be printed, until stopped by placing ACS 0 up. Placing ACS 9 down, while the specific pair is being printed, will cause the program to start printing where it left off before ACS 9 was raised. See section 8.2.7 for detailed operating instructions.

Placing ACS 1 up at any time will allow the program to continuously print the three pairs of current characters. See the table of restarting addresses appearing at the end of this document.

Immediately after the completion of 7F, 7G is executed. Test 7G tests the carriage return function for bounce, and for binding. The test starts by printing a space, followed by a line of 71 O's. At the end of the line two carriage returns are issued. After the second carriage return an X is printed. The X should fall directly in the space at the beginning of the line. This procedure is repeated 36 times, shortening the length of each line by 2 characters. By observing the left hand margins, the operator may easily detect any variation in spacing between the X and first O of each line. There should be no over-printing.

Placing ACS 0 up will halt the test immediately.

Placing ACS 1 up will cause the entire test to be repeated.

Manually depositing the complement of a desired line length into location 1133, and then re-starting 7G with ACS 9 up, will allow a specific line length to be continuously repeated. See section 8.2.8 for detailed operating instructions.

Test 7H is automatically executed. Test 7H tests the line feed functions of the teleprinter. The main function tested for is the ability of the roller to lock firmly into place after each line feed. Roll-back, or double spacing spacing will be apparent with the pattern provided.

Sequences of from 1 to 9 line feeds are given, with a number (1 to 9) being first printed, along with a stall of approximately 1-sec, then the sequence of line feeds. Between each line feed a slash is printed. Any variation of spacing between the slashes indicates some adjustment is necessary to correct the variation.

The 1-sec stall is included to give the operator time to examine the number printed before the sequence begins.

ACS 0 placed up will halt the test after completion of the current line feed sequence.

ACS 1 up will allow the complete test to loop continuously.

By placing the octal equivalent of the desired number of line feeds into location 1013, and placing ACS 9 up, a specific number of line feeds may be continuously tested. See section 8.2.9 for detailed operating instructions.

Test 7I is executed next. This is a test of the space functions. One line consisting of alternate spaces and O's is printed, followed by a carriage return. An X is printed in the first space, followed by two carriage returns. A count for the spacing is incremented by two. The teleprinter then spaces according to this count, and prints an X followed by two carriage returns. This sequence is repeated until the line is composed of alternate X and O's. Any overprint indicates a spacing error. Only one line is printed.

Placing ACS 0 up will halt the program.

Placing ACS 1 up will allow the complete test to be repeated continuously.

Placing ACS 9 up, and the octal equivalent of any desired number of spaces in location 1012, will allow the specific number to be repeated on one line. See section 8.2.10 for detailed operating instructions.

The next test executed is test 7J. This test makes sure the right hand margin is set for a line length of 72 characters.

The program first spaces 69 positions. Four characters are then printed, in order, = 0 / .
If the right hand margin is set correctly, the first slash will be printed in position 72 with the second slash over-printing to form a X, i.e., = OX. No overprint of the slashes indicates a right margin adjusted for greater than 72 characters. Any overprint other than the slashes indicates a right margin adjusted for less than 72 characters.

Two lines are printed before going on to test 7K.

ACS 0 up will halt the program after completing one line.

ACS 1 up will allow the test to loop continuously.

ACS 9 is not used with test 7J.

Test 7K is performed next, and is the last test performed on the teleprinter. ACS 2 should be set, to indicate whether a KSR 33 or 35 is being used, before test 7K is executed. The mechanical worst case for the KSR 33 or KSR 35 consists of a group of four characters repeated continuously in a fixed sequence for three full lines, and then a reverse sequence for another three lines. The test should be allowed to run for no less than twelve lines.

The pattern for a KSR 33 consists of the characters ' ← W / . This pattern produces maximum rotation and vertical movement of the type-wheel.

The pattern for a KSR 35 consists of the characters ' [? C . This pattern produces maximum horizontal and vertical movement of the type-box.

The type of errors to be expected with either printer is that of character spacing.

ACS 0 up will cause a program halt at the end of the current line.

ACS 3-17 will provide variable printing-speed control. Any combination of these ACS may be set while the program is running. All of the ACS up gives the slowest speed, and all down gives normal speed.

5.2.8 Part 2 - Keyboard Control Logic Tests 1-4 - Each of the control logic tests is preceded by a printout of a number to identify the test. Tests 2 through 4 require the operator to input any one character from the keyboard. This is done immediately following the message PRESS A KEY, during tests 2,3,and 4. After test 4 is completed successfully the message, OK, is printed, followed by a halt with PC = 3221 (PRHLT2). This message is omitted if the program is looping on tests 2-4.

5.2.9 Test 1 - Illegal Instruction -The header,1,is printed, followed by CAF IOT. The AC is cleared, and an IOT of 700300 is issued. This IOT should not cause any change in the contents of the AC, nor should it effect the keyboard flag. If no errors are detected, test 2 is executed.

If the contents of the AC are changed an error halt occurs with PC = 2522 (KE01).

If the keyboard flag is set an error halt occurs with PC = 2517 (KE01A)

5.2.10 Test 2 - Set Keyboard Flag - The header,2, is printed followed by the message, PRESS A KEY, after which the program immediately begins a 5 sec timing loop to wait for input. Test 3 is immediately executed after the keyboard flag is set.

If the keyboard flag is not set within the 5 sec period, an error halt occurs with PC = 2573 (KE02).

5.2.11 Test 3 - Clear Flag with KRB - The header, 3, is printed followed by the message, PRESS A KEY. The program will wait in a loop until the keyboard flag is set by an input. As soon as the flag is set, the input buffer is read using the KRB IOT. This instruction should clear the flag immediately. If the flag has been cleared, test 4 is executed.

If the keyboard flag is not clear following a KRB, an error halt occurs with PC = 3120 (KE03).

5.2.12 Test 4 - Clear Buffer to Ones with CAF - The header, 4, is printed followed by the message, PRESS A KEY. The program then issues a CAF instruction, followed by a KRB. The contents of the input buffer must equal 377. If successful, the program then loops, waiting for an input from the keyboard. When an input is detected, the buffer is read and another CAF instruction issued. The buffer is read a second time, and the contents should equal 377. If both tests are successful, the message , OK , is printed and a halt occurs with PC = 3221 (PRHLT2). Press CONTINUE to receive the header for test 5, or start test 5 from location 3300 to omit the header.

If the buffer contents do not equal 377 after either of the two CAF instructions, an error halt occurs with PC = 3202 (KE04)

5.2.13 Test 5 - Keyboard Character Input Test - Test 5 provides the operator with means for testing all keyboard characters, plus checking the character shift functions of the input buffer at the same time.

Immediately following the start of test 5, the program enters a 2 sec timing loop to wait for input. As soon as an input is detected, the input character is stored and the input buffer is continuously read for approximately 150 msec to see if the buffer contents continue shifting after the flag has been set. If all is in order, the character read, plus a space, is printed and the 2-sec timing loop is again initiated. See the example below which shows the resulting format.

An automatic carriage return, line feed is issued after the operator has typed 22 characters.

If the program does not detect an input after 2 secs the message, NO INPUT, is printed. The 2-sec loop is again initiated and a new line started.

If the contents of the buffer continue shifting after the flag has been set, the message, CONTENTS OF BUFFER CONT'D SHIFTING AFTER FIRST READ. will be printed. The 2-sec loop is again entered and a new line started. If the operator double-strikes a key, the program will interpret this as an error and print the above message.

Example of format:

AA BB CC DD EE FF GG HH II JJ KK LL MM NN OO PP QQ RR SS TT UU VV

ACS 0 up will halt the program at the end of the 2-sec timing loop. Press CONTINUE to re-execute.

5.2.14 Test 6 - Keyboard Interrupt Test - Test 6 may be started from location 3374 to receive a header and instructions, or from location 3400 (KTS6) to omit the header and instructions.

The purpose of this test is to test the ability of the teletype control logic to accept an input from the keyboard while the teleprinter is operating. Program interrupt is enabled during this test.

The program continuously prints the message, PRESS A KEY, with interrupt enabled. When an input from the keyboard is detected, the program immediately stops printing, and waits for further input from the keyboard. The operator indicates end of keyboard input by pressing control D (EOT). The program will output the character(s) received. After the last character has been printed the program continues with the message, PRESS A KEY.

Only one or two characters from the keyboard are sufficient to perform this test. However, the entire upper 4K field of core memory is reserved for one input message. Input messages longer than one character are stored away with two characters per word. This provides a maximum message length of 8K characters. If the message length reaches 8K characters, the message, FULL INPUT BUFFER, will be printed, followed by a dump of the message. Regardless of the message length the program interrupt is enabled even when the input message is being printed.

ACS 0 up will halt the test immediately. Press CONTINUE to re-execute.

5.3 Operating Instructions

a. Place the HRI tape in the reader.

b. Press I/O RESET, and then READ-IN.

c. The program will halt with PC = 4465 (PRHLT4), and the MB = 740040.

5.3.1 Part 1 - Teleprinter Tests -

a. Set the ADDRESS SWITCHES to 100.

b. If control logic tests 2-5 are to be looped, raise ACS 2. If not, go on to step c.

c. Press I/O RESET, and then START.

d. When test 7K (Mechanical Worst Case) is reached, the program will run continuously until stopped by the operator.

5.3.2 Part 2 - Keyboard Input Tests

a. Set the ADDRESS SWITCHES to 2500.

b. If control logic tests 2-4 are to be looped, place ACS 2 up. If not, go on to step c.

c. Press I/O RESET, and then START.

d. If not looping on tests 2-4, OK will be printed, followed by a halt with PC = 3321 (PRHLT2). Press CONTINUE to receive test 5 header, or set the ADDRESS SWITCHES to 3300 (KTS5), press I/O RESET, and then START.

e. During test 5, type in all keyboard characters. When satisfied that the input logic and keyboard are operating correctly, go on to f.

f. Set the ADDRESS SWITCHES to 3374 to receive test 6 header and instructions, or to 3400 (KTS6) to omit header and instructions.

g. Press I/O RESET, and then START.

h. The message, PRESS A KEY, will be continuously printed.

i. Press any key and wait for the program to halt. The output message will be garbled after the key is pressed.

j. To verify that the input character was properly received, press CTRL D keys. The character inputted will be printed followed by the message, PRESS A KEY, being resumed.

k. Test 6 is the last test performed by the program.

6. ERRORS

6.1 Error Halts and Description

All program halts and their descriptions are listed in Table 1 which appears at the end of this document. The modules listed for each error halt were chosen as being the most likely at fault.

6.2 Error Recovery

Pressing CONTINUE after an error halt will cause the program to re-execute the test which failed.

Placing ACS 1 up before pressing CONTINUE will enable 'scope mode for the failing test.

Recovery from program halts, either at the end of a test or as a result of ACS 0 up, may be done by pressing CONTINUE. The program will continue on in sequence.

7. RESTRICTIONS

7.1 Starting Restrictions

(None)

7.2 Operating Restrictions

Both parts 1 and 2 enable program interrupt at certain times. Because of this, the user must make sure that any external devices which may cause unwanted interrupts are turned off.

8. MISCELLANEOUS

8.1 Execution Time

Part 1 - When looping on test 2-5 the required time per pass is approximately 8 seconds.

The teleprinter tests 7 through 7J require approximately 10-1/2 minutes.

Part 2 - If looping on tests 2-4 the execution time is approximately 10 to 15 seconds, depending on the rate which input characters are received.

No time can be computed for tests 5 and 6 since manual operation is required.

8.2 Applications

8.2.1 'Scope Mode - Parts 1 and 2 Control Logic Tests - 'Scope mode for any of the keyboard or teleprinter control logic tests may be entered by placing ACS 1 up, and pressing CONTINUE after an error halt.

Any control logic test may be restarted with ACS 1 up to initiate 'scope mode. The restarting addresses are listed below.

Part 1 - Tests 1-5

Test	Starting Address
1	100
2	200
3	300
4	400
5	500

Part 2 - Tests 1-4

Test	Starting Address
1	2500
2	2550
3	3100
4	3150

8.2.2 "Fast" 'Scope Mode Loop - A short loop is provided which accepts input from the keyboard. The loop may be halted by placing ACS 0 up. The halt will occur after the next input character is received. The PC will equal 2076, and the AC will contain the last character received.

Set the ADDRESS SWITCHES to 4200.

Press I/O RESET and then START.

A CAF instruction is issued at the beginning of the loop.

8.2.3 Print-out of Buffer Contents After Each Shift - If 'scoping the keyboard logic does not provide sufficient information for debugging, a routine is provided which will print the contents of the input buffer after each TTI clock shift time.

The routine may be used to test a single character suspected of malfunctioning, the buffer itself, to make certain the contents stop shifting properly, or the contents of the buffer with no input.

Set the ADDRESS SWITCHES to 3700, and all ACS down.

Press I/O RESET and then START.

The header shown below will be printed, and the routine immediately enters a 5-sec timing loop to wait for input.

I 0 1 2 3 4 5 6 7 8 9

Where: I = Initial contents of buffer before input.
This value should always = 377.

0 = Contents of buffer after first shift.
This value should always = 177, as a result of the start pulse entering the buffer.

1 through 8 = Will vary according to the character typed. However, column 1 should equal one of two values; either 077, or 277. Column 8 will equal the octal value of the character typed.

9 = The contents of the buffer after the shifting should have stopped. The octal value under 9 must always equal the value under 8. If not, the contents continued shifting when they should have stopped. The value printed is the value as read from the buffer at the end of the 5 sec period.

An example of the result of the character A being typed is shown below.

I 0 1 2 3 4 5 6 7 8 9

A

377 177 277 137 057 027 013 005 202 301 301

If no key is pressed before the 5 sec period is timed out, the value in each column should equal 377. This may be valuable if the content of the buffer logic is suspected of changing intermittently.

Immediately after an input is detected the 5 sec timing loop is re-initiated. The information printed will therfore occur 5 sec after an input.

If a key is double-struck the printout occurs immediately, and the information will be erroneous.

A halt occurs after the information is printed with PC = 4037 (PRHLT3). Press CONTINUE to re-execute the routine.

8.2.4 Simulation of Characters - The user may simulate any character by placing ACS 1 up, and the octal equivalent of the desired character in ACS 10 - 17. Start from location 3700, or press CONTINUE if halted at location 4037 (PRHLT3). The results printed will appear in the format shown in the example above. A halt occurs with PC = 4037 (PRHLT3) after simulation is completed. Unless another simulation is desired, place ACS 1 down before pressing CONTINUTE to re-execute the program.

8.2.5 Output Printing Speed in msec -

a. Set the ADDRESS SWITCHES to 1700.

b. Press I/O RESET and then START.

c. A carriage return is used for output.

d. The values printed should be near 110 msec.

Upon completion of loading the program, a routine is executed which determines whether the PDP-9 being used has a 1.0 or 1.2 μsec memory cycle time. The accuracy of the printed times in msec is directly dependent on the accuracy of the clock being used. The accuracy of the loop itself is ±8 μsec if a 1.0 μsec cycle time is being used, and ±16 μsec if a 1.2 μsec cycle time is used.

ACS 0 placed up will halt the program with PC = 2076. Press CONTINUE to re-execute.

8.2.6 Tests 7 through 7F - Specific Pairs of Characters

a. Set the ADDRESS SWITCHES to 1012.

b. Place the first character to be printed in ACS 10-17. Place the second character in ACS 1-8.

c. Press DEPOSIT (up).

d. Place all ACS down, and then place ACS 9 up.

e. Set the ADDRESS SWITCHES to 700.

f. Press I/O RESET and then START.

The program will continuously print the selected pair. ACS 0 placed up will halt the program with PC = 2076 (PRHLT1).

8.2.7 Test 7G - Specific Line Length

a. Set the ADDRESS SWITCHES to 1133. This location contains 777671.

b. Place the complement of the octal equivalent of the desired line length in the ACS.

c. Press DEPOSIT (up).

d. Place all ACS down, and then place ACS 9 up.

e. Set the ADDRESS SWITCHES to 1126.

f. Press I/O RESET and then START.

The program will continuously perform the carriage return test with the specified line length. ACS 0 placed up will halt the program with PC = 2076 (PRHLT1).

Location 1133 must be restored to 777671, if normal operation is desired.

8.2.8 Test 7H - Specific Number of Line Feeds

a. Set the ADDRESS SWITCHES to 1013.

b. Place in the ACS the octal equivalent of the desired number of line feed.

c. Press DEPOSIT (up).

d. Place ACS down, and then ACS 9 up.

e. Set the ADDRESS SWITCHES to 1202.

f. Press I/O RESET and then START.

The program will continuously print the desired number of line feeds, with a 1-sec (approximately) stall between sequences. The number preceding the first sequence will be 1, but no number will be printed therafter, unless the test is restarted.

Placing ACS 0 up will halt the routine at the completion of one sequence. PC will = 2076 (PRHLT1).

8.2.9 Test 71 - Specific Number of Spaces -

a. Set the ADDRESS SWITCHES to 1012.

b. Place in the ACS the octal equivalent of the desired spacing on the line (including the position of X), minus 1. The positions are referenced to position 1, the first space before the first O.

c. Press DEPOSIT (up).

d. Place all ACS down, then place ACS 9 up.

e. Set the ADDRESS SWITCHES to 1265.

f. Press I/O RESET and then START.

ACS 0 may be placed up to halt the program. PC will equal 2076 (PRHLT1).

Press CONTINUE to re-execute.

8.2.10 Looping on Control Logic Tests

Part 1 - Test 2-5

a. Set the ADDRESS SWITCHES to 200.

b. Place ACS 2 up.

c. Press I/O RESET and then START.

The program will loop continuously until an error is detected or until stopped with PROGRAM STOP.

Part 2 - Tests 2-4

a. Set the ADDRESS SWITCHES to 2550.

b. Place ACS 2 up.

c. Press I/O RESET and then START.

The program will loop continuously until an error is detected, or until stopped with PROGRAM STOP.

8.2.11 Variable Printing Speed Control - ACS 3-12 provide the printing speed control during teleprinter test 7K (mechanical worst case). The ACS may be changed while the program is running. All ACS up will provide the slowest speed, and all down provide normal speed. ACS 0 may still be used to halt the test.

9. PROGRAM DESCRIPTION

The PDP-9 TTY Test is divided into two unique parts, part 1 begins by testing the teleprinter control logic. Provision is made to loop on four of the five control logic tests in order that the control logic may be tested with marginal power-supply voltages. If the control logic tests run without error, the remaining errors will be in the individual data paths. The rest of part 1 consists of various tests on the teleprinter itself. Any errors during this portion of part 1 must be detected by the operator while watching the printout.

Part 2 begins by testing the keyboard control logic. Provision is made to loop on three of the four control logic tests in order that the control logic may be tested with marginal power-supply voltages. The rest of part 2 consists of tests on the keyboard itself. The operator is required to provide inputs from the keyboard. The operator must watch the printed information to determine if any errors are present.

TABLE 1 ERROR HALTS AND DESCRIPTIONS

C(PC)	Tag	Test Number	Identification	Suggested Type	Module Location
122	E01	1	Teleprinter flag set after IOT 700400.		
			If character "A" printed	S603	C39
			If no character printed	S202	D38
205	E02	2	Flag should not be set	S202	D38
316	E03	3	Flag did not set after TLS issued		
			If teleprinter responded	R111	C35
				S202	D38
				S107	C33
			If no teleprinter response	S205	D32
				S202	D38
				S205	D37
				R450	C40
411	E04	4	Flag did not clear after a TLS	S202	D38
426	E04A	4	Flag did not clear after TCF	S202	D38
522	E05	5	No interrupt occurred, waited 150 msec	R111	D39
536	E05A	5	Spurious interrupt, AC=I/O status Turn off device(s)		
540	E05B	5	Illegal flag from teleprinter	R111	D39

TABLE 1 ERROR HALTS AND DESCRIPTIONS (continued)

C(PC)	Tag	Test Number	Identification	Suggested Type	Module Location
552	E05C	5	Spurious interrupt, AC=I/O status Turn off device(s)		
2076	PRHLT1		Program halt as a result of ACS 0 up		
2517	KE01A	1	Keyboard flag set after IOT 700300.	S202	B38
2522	KE01	1	C(AC) changed after IOT 700300. Check wiring between C40-J and B38-T	S202	D40
2573	KE02	2	Keyboard flag not set, waited 5 seconds	S202 R111	B38 C35
3120	KE03	3	Keyboard flag did not clear after KRB	S202	B38
3201	KE04	4	Buffer did not clear to 377 after a CAF. AC = Contents of buffer	S202 S202 S202 S202 S603	B34 B35 B36 B37 C39
3467	ILLGAL	6	Spurious interrupt. Turn off device(s)		
3743	ERR7		Keyboard flag should not be set. Press CONTINUE to ignore, or restart from location 3700.		
4037	PRHLT3		Program halt which occurs after contents of input buffer are printed. Press CONTINUE to re-execute.		
4465	PRHLT4		Program halt for routine which checks for 1.0 or 1.2 μsec memory cycle time immediately after loading program.		

TABLE 2 RESTARTING ADDRESSES

Test No.			ADDRESS
		Part 1	
1	-	Illegal Instruction	100
2	-	Test for Flag Off	200
3	-	Set Flag With TLS	300
4	-	Clear Flag With TLS and TCF	400
5	-	Interrupt Test	500
6	-	Character Set Test	600
7	-	Alphabet and Numbers	700
7B	-	Test ! " # $ % &	1020
7C	-	Test ' ( ) * + ,	1036
7D	-	Test - ./ @ : ;	1054
7E	-	Test < = > ? [\	1072
7F	-	Test] ↑ ← BELL	1110
7G	-	Test Carriage Return	1126
7H	-	Test Line Feed	1202
7I	-	Test Space	1265
7J	-	Test Right Margin	1362
7K	-	Mechanical Worst Case	1500
		Print Output Clock Time	1700
		Part 2	
1	-	Illegal Instruction	2500
2	-	Set Keyboard Flag	2550
3	-	Clear Flag With KRB	3100
4	-	Clear Buffer to Ones With CAF	3150
5	-	Character Input Test	3300
6	-	Interrupt Test	3374 (Header)
			3400 (No Header)
		Print Contents of Buffer After Shift	3700
		"Fast" 'Scope Mode Loop	4200

```
                                       .TITLE TTY-9
                               /PDP-9 TTY DIAGNOSTIC
                               /PART 1.  TEST TELEPRINTER
                               /
                               /INTERRUPT ROUTINE
                               /
                                       .ABS
ØØØØØ                                  .LOC Ø
ØØØØØ      ØØØØØØ                      Ø
ØØØØ1      7ØØ314                      IORS
ØØØØ2      74ØØ4Ø              LOCA3   HLT                 /INTERRUPT ON ILLEGALLY
                                                           /AC = I/O STATUS
                               /
                               /
                               /TEST 1.  ILLEGAL INSTRUCTION
                               /
ØØ1ØØ                                  .LOC 1ØØ
ØØ1ØØ      7Ø33Ø2              TTST1   CAF
ØØ1Ø1      7ØØØØ4                      CLOF
ØØ1Ø2      777771                      LAW -7
ØØ1Ø3      Ø4ØØ13                      DAC 13
ØØ1Ø4      76Ø3Ø1                      LAW 3Ø1
ØØ1Ø5      7ØØ4ØØ                      7ØØ4ØØ              /ILLEGAL INSTRUCTION
ØØ1Ø6      1Ø21ØØ                      JMS STL15Ø
ØØ1Ø7      7ØØ4Ø1                      TSF                 /FLAG = Ø
ØØ11Ø      741ØØØ                      SKP
ØØ111      6ØØ12Ø                      JMP FLGERR          /ERROR PATH
ØØ112      1Ø2112                      JMS SCOPE
ØØ113      44ØØ13                      ISZ 13
ØØ114      6ØØ1Ø4                      JMP TTST1+4
ØØ115      1Ø2112                      JMS SCOPE           /SUCCESS PATH
ØØ116      6ØØ2ØØ                      JMP TTST2           /EXIT
ØØ117      6ØØ1Ø4                      JMP TTST1+4         /SCOPE
ØØ12Ø      1Ø2112              FLGERR  JMS SCOPE
ØØ121      74ØØ4Ø              FØ1     HLT                 /TTY FLAG SET
ØØ122      6ØØ1Ø4                      JMP TTST1+4
                                       .EJECT
```

```
****
      00200                             .LOC 200
                              /TEST 2.  TEST FOR FLAG OFF
      00200     102100        TTST2     JMS STL150                    /WAIT 150 MS
      00201     700401                  TSF                     /FLAG SHOULD BE OFF
      00202     600206                  JMP OK2
      00203     102112                  JMS SCOPE               /ERROR PATH
      00204     740040        F02       HLT                     /TTY FLAG ON ILLEGALLY
      00205     600201                  JMP TTST2+1             /SCOPE
      00206     102112        OK2       JMS SCOPE               /CHECK FOR SCOPE MODE
      00207     600300                  JMP TTST3               /SUCCESS PATH
      00210     600201                  JMP TTST2+1             /SCOPE
                              /
                              /
                              /TEST 3.  SET FLAG WITH TLS
                              /
      00300                             .LOC 300
                              /
      00300     777763        TTST3     LAW -15
      00301     040013                  DAC 13
      00302     760215                  LAW 215                 /USE CARRIAGE RETURN FOR OUTPUT
      00303     700406                  TLS
      00304     102100                  JMS STL150              /WAIT 150 MS FOR FLAG
      00305     700401                  TSF                     /FLAG SHOULD BE SET
      00306     600314                  JMP ERR3                /ERROR PATH
      00307     440013                  ISZ 13
      00310     600302                  JMP TTST3+2
      00311     102112                  JMS SCOPE               /SUCCESS PATH
      00312     600400                  JMP TTST4               /EXIT
      00313     600302                  JMP TTST3+2             /SCOPE
      00314     102112        ERR3      JMS SCOPE               /CHECK FOR SCOPE MODE
      00315     740040        E03       HLT                     /FLAG NOT SET
      00316     600302                  JMP TTST3+2
                                        .EJECT
```

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```
                                /TEST 4.  CLEAR THE FLAG WITH TLS AND TCF
                                /
   ØØ4ØØ                                  .LOC 4ØØ
                                /
   ØØ4ØØ      76Ø215            TTST4     LAW 215          /SET FLAG TO START WITH
   ØØ4Ø1      7ØØ4Ø6                      TLS
   ØØ4Ø2      7ØØ4Ø1                      TSF              /WAIT FOR FLAG
   ØØ4Ø3      6ØØ4Ø2                      JMP .-1
   ØØ4Ø4      7ØØ4Ø6                      TLS              /TRY TO CLEAR FLAG
   ØØ4Ø5      7ØØ4Ø1                      TSF
   ØØ4Ø6      6ØØ412                      JMP OK4          /FLAG CLEARED OK WITH TLS
   ØØ4Ø7      1Ø2112                      JMS SCOPE
   ØØ41Ø      74ØØ4Ø            EØ4       HLT              /FLAG NOT CLEARED IMMEDIATELY
   ØØ411      6ØØ4ØØ                      JMP TTST4        /AFTER TLS
   ØØ412      1Ø2112            OK4       JMS SCOPE        /CHECK FOR SCOPE MODE
   ØØ413      741ØØØ                      SKP
   ØØ414      6ØØ4ØØ                      JMP TTST4        /SCOPE
   ØØ415      76Ø215                      LAW 215
   ØØ416      7ØØ4Ø6                      TLS              /SET THE FLAG FOR TCF TEST
   ØØ417      7ØØ4Ø1                      TSF              /WAIT FOR FLAG
   ØØ42Ø      6ØØ417                      JMP .-1
   ØØ421      7ØØ4Ø2                      TCF              /TRY TO CLEAR
   ØØ422      7ØØ4Ø1                      TSF
   ØØ423      6ØØ427                      JMP OK4A         /FLAG CLEARD OK WITH TCF
   ØØ424      1Ø2112                      JMS SCOPE
   ØØ425      74ØØ4Ø            FØ4A      HLT              /TCF DID NOT CLEAR FLAG
   ØØ426      6ØØ415                      JMP OK4+3        /SCOPE
   ØØ427      1Ø2112            OK4A      JMS SCOPE        /CHECK FOR SCOPE MODE
   ØØ43Ø      6ØØ5ØØ                      JMP TTST5        /EXIT
   ØØ431      6ØØ415                      JMP OK4+3        /SCOPE
                                          .EJECT
```

```
****
                                    /TEST 5.  INTERRUPT TEST
                                    /
     00500                                    .LOC 500
                                    /
     00500      200523      TTST5    LAC JMP5
     00501      040001              DAC 1
     00502      700004              CLOF
     00503      703302              CAF
     00504      760215              LAW 215
     00505      700042              ION                    /TEST FOR ILLEGAL INT.
     00506      102100              JMS STL150             /WAIT 150 MS
     00507      102112              JMS SCOPE              /SUCCESS PATH
     00510      741000              SKP
     00511      600500              JMP TTST5              /SCOPE
     00512      200524              LAC JMP6               /TEST TELEPRINTER INT
     00513      040001              DAC 1
     00514      760215      TPINT   LAW 215
     00515      700042              ION
     00516      700406              TLS                    /OUTPUT A CARRIAGE RETURN
     00517      102100              JMS STL150             /WAIT 150 MS
     00520      102112              JMS SCOPE              /ERROR PATH - NO INTERRUPT
     00521      740040      E05     HLT
     00522      600514              JMP TPINT              /SCOPE
                                    /
     00523      600525      JMP5    JMP ILLINT
     00524      600541      JMP6    JMP TSTFLG
                                    .EJECT
```

```
****
                              /INTERRUPT SERVICE ROUTINES
                              /
    00525     102112          ILLINT    JMS SCOPE          /CHECK FOR SCOPE MODE
    00526     741000                    SKP
    00527     600500                    JMP TTST5          /SCOPE
    00530     700314                    IORS               /READ STATUS
    00531     504467                    AND (020000
    00532     740200                    SZA                /TEST FOR TELEPRINTER FLAG
    00533     600537                    JMP F05B           /PRINTER FLAG ON ILLEGALLY
    00534     700314                    IORS               /ERROR FROM SPURIOUS INT
    00535     740040          F05A      HLT                /AC = I/O STATUS
    00536     600500                    JMP TTST5
    00537     740040          F05B      HLT                /ILLEGAL FLAG FROM PRINTER
    00540     600500                    JMP TTST5
                              /
    00541     102112          TSTFLG    JMS SCOPE          /CHECK FOR SCOPE MODE
    00542     741000                    SKP
    00543     600514                    JMP TPINT          /SCOPE
    00544     700314                    IORS               /READ I/O STATUS
    00545     504467                    AND (020000
    00546     742200                    SNA
    00547     600553                    JMP OK5            /SUCCESS PATH
    00550     700314                    IORS
    00551     740040          F05C      HLT                /INTERRUPT FROM DEVICE OTHER
    00552     600514                    JMP TPINT          /THAN PRINTER.  AC = I/O STATUS
    00553     200550          OK5       LAC F05C-1                 /SUCCESS
    00554     040001                    DAC 1
    00555     700402                    IOF                /INTERRUPT OFF
    00556     703302                    CAF
    00557     750004                    LAS
    00560     742010                    RTL
    00561     741100                    SPA                /CHECK FOR LOOP ON TESTS 2-5
    00562     600200                    JMP TTST2          /LOOP
    00563     600600                    JMP TST6           /ONLY EXIT
                                        .EJECT
```

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```
                        /TEST 6.  BASIC TEST OF COMPLETE CHARACTER SET
                        /BELL CR LF
                        /PLACE ACS9 UP AND ACS 10-17 SET TO A SPECIFIC
                        /CHARACTER IF DESIRED.  ACS1 SET = LOOP ON TEST
                        /
0'600
0'600     102054        TST6    JMS CRLF
0'601     777774                LAW -4
0'602     040623                DAC LOOPX           /INITIALIZE LOOP COUNTER
0'603     750004                LAS
0'604     741100                SPA                 /CHECK FOR HALT
0'605     102074                JMS HLTST           /HALT
0'606     504470                AND (400            /CHECK FOR SPECIFIC CHAR
0'607     740200                SZA
0'610     600624                JMP PRSPEC          /SPECIFIC
0'611     202120                LAC DOTS6           /TOP OF CHAR TABLE MINUS 1
0'612     040012                DAC 12
0'613     102274                JMS PHDR
0'614     750004                LAS
0'615     740010                RAL
0'616     741100                SPA                 /CHECK FOR LOOP ON TEST
0'617     600601                JMP TST6+1                    /LOOP
0'620     440623                ISZ LOOPX           /TEST FOR 4 LINES
0'621     600603                JMP TST6+3                    /NOT 4 YET
0'622     600700                JMP TTST7           /EXIT
                        /
0'623     000000        LOOPX   0
                        /
0'624     777670        PRSPEC  LAW -110
0'625     041016                DAC LINE            /INITIALIZE LINE COUNT
0'626     750004                LAS
0'627     741100                SPA                 /CHECK FOR HALT
0'630     102074                JMS HLTST           /HALT
0'631     750004                LAS
0'632     101175                JMS TLSSF           /PRINT
0'633     441016                ISZ LINE            /CHECK FOR 72 CHARS
0'634     600626                JMP .-6
0'635     102054                JMS CRLF            /CR, LF
0'636     600624                JMP PRSPEC
                                .EJECT
```

```
↑↑↑↑

                                /TEST 7.  TEST PAIRS OF CHARACTERS
                                /
                                          .LOC 740
                                /
0740    200770          TTST7   LAC JMSS
0741    040714                  DAC GETNXT
0742    200170                  LAC HDR7A       /PRINT TEST7 ALPHABET AND
0743    040012                  DAC 12          /NUMBERS SET
0744    102274                  JMS PHDR
0745    200120                  LAC OUTS6       /CHAR TABLE POINTER
0746    040011                  DAC 11
0747    041013                  DAC TEMP+1
0750    750004                  LAS
0751    504470                  AND (440        /CHECK FOR SPECIFIC PAIR
0752    740200                  SZA
0753    741000                  SKP             /SPECIFIC PAIR
0754    100772          GETNXT  JMS NEWRD
0755    777775                  LAW -3
0756    041017                  DAC CNTLNE      /COUNTS 3 LINES
0757    102254                  JMS CRLF        /CR,LF
0760    777775                  LAW -3
0761    041016                  DAC LINE        /COUNTS GROUPS PER LINE
0762    777770                  LAW -10
0763    041015                  DAC GROUP       /COUNTS CHAR PER GROUP
0764    201012          PRINT2  LAC TEMP
0765    101175                  JMS TLSSF       /PRINT FIRST
0766    102065                  JMS ROTAT9      /POSITION NEXT CHAR.
0767    101175                  JMS TLSSF       /PRINT SECOND
0770    750004                  LAS
0771    741100                  SPA             /CHECK FOR HALT
0772    102074                  JMS HLTST
0773    441015                  ISZ GROUP       /CHECK FOR 16 CHARS
0774    600724                  JMP PRINT2      /NOT 16 YET
0775    441016                  ISZ LINE        /CHECK FOR 3 GROUPS
0776    600764                  JMP NOT3G       /NOT 3 YET
0777    750004          CKLINE  LAS
1000    504470                  AND (440
1001    740200                  SZA             /CHECK FOR SPECIFIC PAIR
1002    600717                  JMP GETNXT+3    /SPECIFIC
1003    441017                  ISZ CNTLNE      /CHECK FOR 3 LINES
1004    600755                  JMP NOT3L       /NOT 3 LINES YET
1005    750004                  LAS
1006    740010                  RAL
1007    741100                  SPA             /CHECK FOR LOOP ON TEST
1010    600761                  JMP LOOP7       /REPEAT
1011    200011                  LAC 11
1012    041013                  DAC TEMP+1      /UPDATE POINTER STORAGE
1013    102254                  JMS CRLF        /CR,LF
1014    600714                  JMP GETNXT              /GET A NEW PAIR
                                .EJECT
```

```
****
     00755    201013          NOT3L   LAC TEMP+1
     00756    040011                  DAC 11              /RESTORE POINTER
     00757    100772                  JMS NEWRD           /GET A NEW PAIR
     00760    600717                  JMP GETNXT+3
                              /
     00761    777775          LOOP7   LAW -3
     00762    041017                  DAC CNTLNE
     00763    600755                  JMP NOT3L
     00764    750004          NOT3G   LAS
     00765    504470                  AND (400
     00766    740200                  SZA                 /CHECK FOR SPECIFIC PAIR
     00767    600722                  JMP PRINT2-2        /SPECIFIC PAIR
     00770    100772          JMSS    JMS NEWRD           /GET A NEW PAIR
     00771    600722                  JMP PRINT2-2
                              /
     00772    000000          NEWRD   0
     00773    220011                  LAC* 11
     00774    544471                  SAD (212215         /CHECK FOR END OF TABLE
     00775    600737                  JMP CKLINE
     00776    041012                  DAC TEMP
     00777    544472                  SAD (242241         /CHECK FOR START OF PUNCTUATION
     01000    741000                  SKP
     01001    620772                  JMP* NEWRD                  /EXIT
     01002    200714                  LAC GETNXT
     01003    540770                  SAD JMSS
     01004    741000                  SKP
     01005    620772                  JMP* NEWRD
     01006    200215                  LAC HDR7B
     01007    040012                  DAC 12
     01010    102274                  JMS PHDR            /PRINT TEST PUNCTUATION SET
     01011    601020                  JMP TS7B
                              /
     01012    000000          TEMP    0
     01013    000000                  0
     01014    000000                  0
     01015    000000          GROUP   0
     01016    000000          LINE    0
     01017    000000          CNTLNE  0
                                      .EJECT
```

```
↑↑↑↑
                        /
                        /TEST 7B.  TEST ! " # $ % &
                        /
01020   102754  TS7B    JMS CRLF            /CR, LF
01021   202236          LAC PR7B            /7B
01022   040012          DAC 12
01023   102274          JMS PHDR
01024   102754          JMS CRLF            /CR,LF
01025   202163          LAC PUNCT           /CHAR TABLE POINTER
01026   040011          DAC 11
01027   041013          DAC TEMP+1
01030   220011          LAC* 11             /GET FIRST PAIR
01031   041012          DAC TEMP
01032   201035          LAC RJMP1           /SET RETURN FOR 7C
01033   040714          DAC GETNXT
01034   600715          JMP GETNXT+1        /EXIT
                        /
01035   601036  RJMP1   JMP TS7C
                        /
                        /
                        /TEST 7C.  TEST ' ( ) * + ,
                        /
01036   102754  TS7C    JMS CRLF            /CR, LF
01037   202241          LAC PR7C            /7C
01040   040012          DAC 12
01041   102274          JMS PHDR
01042   102754          JMS CRLF            /CR,LF
01043   202164          LAC PUNCT+1
01044   040011          DAC 11
01045   041013          DAC TEMP+1
01046   220011          LAC* 11             /GET FIRST PAIR
01047   041012          DAC TEMP
01050   201053          LAC RJMP2           /SET RETURN FOR 7D
01051   040714          DAC GETNXT
01052   600715          JMP GETNXT+1
                        /
01053   601054  RJMP2   JMP TS7D
                        .EJECT
```

↑↑↑↑

```
                                /TEST 7D.  TEST - . / @ : ;
                                /
01054           102054          TS7D    JMS CRLF                /CR, LF
01055           202244                  LAC PR7D
01056           040012                  DAC 12
01057           102274                  JMS PHDR                /PRINT 7D
01060           102054                  JMS CRLF                /CR,LF
01061           202165                  LAC PUNCT+2
01062           040011                  DAC 11
01063           041013                  DAC TEMP+1
01064           220011                  LAC* 11                 /GET FIRST PAIR
01065           041012                  DAC TEMP
01066           201071                  LAC RJMP3               /SET RETURN FOR 7E
01067           040714                  DAC GETNXT
01070           600715                  JMP GETNXT+1
                                /
01071           601072          RJMP3   JMP TS7E
                                /
                                /
                                /
                                /TEST 7E.  TEST < = > ? [ \
                                /
01072           102054          TS7E    JMS CRLF                /CR, LF
01073           202247                  LAC PR7E
01074           040012                  DAC 12                  /PRINT 7F
01075           102274                  JMS PHDR
01076           102054                  JMS CRLF                /CR,LF
01077           202166                  LAC PUNCT+3
01100           040011                  DAC 11
01101           041013                  DAC TEMP+1
01102           220011                  LAC* 11                 /GET FIRST PAIR
01103           041012                  DAC TEMP
01104           201107                  LAC RJMP4               /SET RETURN FOR 7F
01105           040714                  DAC GETNXT
01106           600715                  JMP GETNXT+1
                                /
01107           601110          RJMP4   JMP TS7F
                                        .EJECT
```

```
****
                                /TEST 7F.  TEST ] ↑ LEFT ARROW  BELL
                                /
01110   102154      TS7F        JMS CRLF            /CR, LF
01111   202252                  LAC PR7F
01112   040012                  DAC 12
01113   102274                  JMS PHDR            /PRINT 7F
01114   102154                  JMS CRLF
01115   202167                  LAC PUNCT+4
01116   040011                  DAC 11
01117   041013                  DAC TEMP+1
01120   220011                  LAC* 11
01121   041012                  DAC TEMP            /GET FIRST PAIR
01122   201125                  LAC RJMP5           /SET RETURN FOR CR, LF TESTS
01123   040714                  DAC GETNXT
01124   600715                  JMP GETNXT+1
                                /
01125   601126      RJMP5       JMP TS7G
                                /
                                /
                                /TEST 7G.  TEST CARRIAGE RETURN
01126   102154      TS7G        JMS CRLF            /CR, LF
01127   202255                  LAC PR7G
01130   040012                  DAC 12
01131   102274                  JMS PHDR            /PRINT 7G
01132   102154                  JMS CRLF
01133   777671                  LAW -107            /-71
01134   041012                  DAC TEMP            /INTIALIZE CHAR COUNTERS
01135   041013                  DAC TEMP+1
01136   760240      ANOTHR      LAW 240             /SPACE
01137   101175                  JMS TLSSF
                                .EJECT
```

```
↑↑↑↑
     01140     760317          ANTHRO    LAW 317              /0
     01141     101175                    JMS TLSSF
     01142     750004                    LAS
     01143     741100                    SPA                  /CHECK FOR HALT
     01144     102074                    JMS HLTST
     01145     441012                    ISZ TEMP             /INCREMENT COUNT
     01146     601140                    JMP ANTHRO           /PRINT ANOTHER 0
     01147     760215                    LAW 215
     01150     101175                    JMS TLSSF            /CARRIAGE RETURN
     01151     101175                    JMS TLSSF
     01152     760330                    LAW 330              /X
     01153     101175                    JMS TLSSF            /X SHOULD APPEAR IN THE SPACE
     01154     750004                    LAS
     01155     504470                    AND (400
     01156     740200                    SZA                  /CHECK FOR SPECIFIC LINE LENGTH
     01157     601132                    JMP TS7G+4           /SPECIFIC
     01160     441013                    ISZ TEMP+1           /DONE WITH TEST IF 0
     01161     741000                    SKP
     01162     601170                    JMP .+6
     01163     441013                    ISZ TEMP+1           /DECREMENT LINE LENGTH
     01164     201013                    LAC TEMP+1
     01165     041012                    DAC TEMP
     01166     102054                    JMS CRLF             /CR,LF
     01167     601136                    JMP ANOTHR           /NEW LINE
     01170     750004                    LAS
     01171     740010                    RAL
     01172     741100                    SPA                  /CHECK FOR LOOP ON TEST
     01173     601132                    JMP TS7G+4           /LOOP
     01174     601202                    JMP TS7H             /TEST LINE FEED
                                 /
     01175     000000          TLSSF     0
     01176     700406                    TLS
     01177     700401                    TSF
     01200     601177                    JMP .-1
     01201     621175                    JMP* TLSSF
                                         .EJECT
```

```
****

                        /TEST 7H.  TEST LINE FEED
                        /
01202   102054  TS7H    JMS CRLF        /CR, LF
01203   202260          LAC [7H
01204   040012          DAC 12
01205   102274          JMS PRNUM       /PRINT 7H
01206   102054          JMS CRLF
01207   750004          LAS
01210   544470          AND (40
01211   740200          SZA             /CHECK FOR SPECIFIC NUMBER
01212   601224          JMP LNFEED+5    /SPECIFIC
01213   141412          DZM TEMP        /INITIALIZE COUNTERS
01214   141413          DZM TEMP+1
01215   201264          LAC N260
01216   041414          DAC TEMP+2
01217   441414  LNFEED  ISZ TEMP+2
01220   201414          LAC TEMP+2
01221   544473          SAD (272        /DONE 1 LOOP IF EQUAL
01222   601257          JMP LOOPLF      /CHECK LOOP ON TEST
01223   101175          JMS TLSSF       /PRINT NUMBER
01224   777773          LAW -5
01225   041416          DAC LINE
01226   102100          JMS STL15M
01227   441416          ISZ LINE
01230   601226          JMP .-2
01231   201413          LAC TEMP+1
01232   740401          CMA
01233   041412          DAC TEMP
01234   102054          JMS CRLF        /CR,LF
01235   441412  INCR    ISZ TEMP        /COUNT LINE FEEDS
01236   601247          JMP FEED
01237   760215          LAW 215
01240   101175          JMS TLSSF
01241   750004          LAS
01242   544470          AND (40
01243   740200          SZA             /CHECK FOR SPECIFIC NUMBER
01244   601224          JMP LNFEED+5    /SPECIFIC
01245   441413          ISZ TEMP+1      /INCREMENT COUNT
01246   601217          JMP LNFEED      /MAIN LOOP
                        .EJECT
```

```
****
     01247     760334          FEED      LAW 334
     01250     101175                    JMS TLSSF             /SLASH
     01251     750004                    LAS
     01252     741100                    SPA                   /CHECK FOR HALT
     01253     102074                    JMS HLTST             /HALT
     01254     760212                    LAW 212               /LINE FEED
     01255     101175                    JMS TLSSF
     01256     601235                    JMP INCR
     01257     750004          LOOPLF    LAS
     01260     740010                    RAL
     01261     741100                    SPA                   /CHECK FOR LOOP ON TEST
     01262     601213                    JMP LNFEED-4
     01263     601265                    JMP TS7I              /TEST SPACE
                                 /
     01264     000260          N260      260
                                         .EJECT
```

↑↑↑↑

```
                        /TEST 7I.  TEST SPACE
                        /
01265   102054  TS7I    JMS CRLF            /CR,LF
01266   202263          LAC PR7I
01267   040012          DAC 12
01270   102274          JMS PHDR            /PRINT 7I
01271   777777          LAW -1
01272   041016          DAC LINE
01273   102054          JMS CRLF            /INITIALIZE LINE COUNT
01274   204474          LAC (317240         /SPACE, 0
01275   041013          DAC TEMP+1
01276   777735          LAW -43             /-36
01277   041014          DAC TEMP+2
01300   201213  SPAOH   LAC TEMP+1
01301   101175          JMS TLSSF           /PRINT SPACE, 0
01302   102065          JMS ROTAT9          /ROTATE 9 RIGHT
01303   101175          JMS TLSSF
01304   750004          LAS
01305   741100          SPA
01306   102074          JMS HLTST
01307   441014          ISZ TEMP+2                  /CHECK FOR 72
01310   601300          JMP SPAOH
01311   760215          LAW 215             /DONE WITH SPACE, A
01312   101175          JMS TLSSF           /CARRIAGE RETURN
01313   101175          JMS TLSSF
01314   750004          LAS
01315   504470          AND (440
01316   740200          SZA                 /CHECK FOR SPECIFIC COUNT
01317   741000          SKP                 /SPECIFIC
01320   141012          DZM TEMP            /INITIALIZE COUNTER
01321   201012  RESTRT  LAC TEMP
01322   541361          SAD ONE10           /CHECK FOR 71 CHARS
01323   601352          JMP LOOPSP          /CHECK FOR LOOP ON TEST
01324   740001          CMA
01325   041017          DAC CNTLNE
01326   760330          LAW 330             /X
01327   441017  SPACNT  ISZ CNTLNE                  /PRINT X WHEN 0
01330   601347          JMP SPACE
01331   101175          JMS TLSSF           /PRINT X
01332   760215          LAW 215
01333   101175          JMS TLSSF           /CARRIAGE RETURN X 2
01334   101175          JMS TLSSF
01335   750004          LAS
01336   741100          SPA
01337   102074          JMS HLTST
01340   750004          LAS
01341   504470          AND (440
01342   740200          SZA                 /CHECK FOR SPECIFIC COUNT
01343   601321          JMP RESTRT          /SPECIFIC
01344   441012          ISZ TEMP            /INCR SPACE COUNT BY 2
01345   441012          ISZ TEMP
01346   601321          JMP RESTRT
                        .EJECT
```

```
↑↑↑↑
    01347    760240    SPACE    LAW 240        /SPACE
    01350    101175             JMS TLSSF
    01351    601326             JMP SPACNT-1
    01352    441016    LOOPSP   ISZ LINE       /CHECK FOR 1 LINE
    01353    601273             JMP TS7I+6              /DO ANOTHER LINE
    01354    750004             LAS
    01355    740010             RAL            /CHECK FOR LOOP ON TEST
    01356    741100             SPA
    01357    601271             JMP TS7I+4     /LOOP
    01360    601362             JMP TS7J       /TEST RIGHT MARGIN
                       /
    01361    000110    ONE10    110
                                .EOT
```

```
                        /PDP-9 TTY TEST - TAPE 2
                        /
                        /TEST 7J.  TEST RIGHT MARGIN
                        /PRINTED DATA SHOULD EQUAL =0X FOR 72 CHAR. LINE
                        /= 0 / \ EQUALS > 72, ANY OVERPRINT EQUALS < 72
                        /
01362   102054  TS7J    JMS CRLF            /CR, LF
01363   202366          LAC PR7J
01364   040012          DAC 12
01365   102274          JMS PHDR            /PRINT 7J
01366   102054          JMS CRLF
01367   777776          LAW -2
01370   041017          DAC CNTLNE          /INITIALIZE LINE COUNT
01371   777673  SPAC69  LAW -115            /INITIALIZE SPACE COUNT
01372   041015          DAC GROUP
01373   760240          LAW 240             /SPACE
01374   101175          JMS TLSSF
01375   441015          ISZ GROUP           /CHECK FOR 69 SPACES
01376   601374          JMP .-2
01377   760275          LAW 275             /=,0 IN POSITIONS 70 AND 71
01400   101175          JMS TLSSF
01401   760317          LAW 317             /0 POSITION 71
01402   101175          JMS TLSSF
01403   760257          LAW 257             // POSITION 72
01404   101175          JMS TLSSF
01405   760334          LAW 334             /\SHOULD OVERPRINT 72
01406   101175          JMS TLSSF
01407   102054          JMS CRLF            /CR,LF
01410   441017          ISZ CNTLNE                  /CHECK FOR 2 LINES
01411   601422          JMP CKHLT
01412   750004          LAS
01413   740010          RAL
01414   741100          SPA                 /CHECK FOR LOOP ON TEST
01415   601366          JMP TS7J+4          /LOOP
01416   750004          LAS
01417   741100          SPA
01420   102074          JMS HLTST           /HALT
01421   601500          JMP TS7K            /TEST MECH. WORST CASE
01422   750004  CKHLT   LAS
01423   741100          SPA
01424   102074          JMS HLTST           /HALT
01425   601371          JMP SPAC69          /NEW LINE
                        .EJECT
```

```
↑↑↑↑
                                /TEST 7K.  MECHANICAL WORST CASE
                                /ACS2 UP FOR MODEL 35, DOWN FOR MODEL 33
                                /AC3-17 CONTROL PRINTING SPEED
                                /MODEL 33 WORST CASE IS ' LEFT ARROW W /
                                /MODEL 35 IS ' [ QUESTION MARK C
U    01426     004470                     .SPACE 2
                                /
     01500                      .LOC 1500
     01500     102054   TS7K    JMS CRLF            /CR,LF
     01501     202271            LAC PR7K
     01502     040012            DAC 12
     01503     102274            JMS PHDR            /PRINT 7K
     01504     102054            JMS CRLF
     01505     750004            LAS
     01506     742010            RTL
     01507     741100            SPA                 /CHECK FOR MODEL 33 OR 35
     01510     601540            JMP MODL35                    /MODEL 35
     01511     204475            LAC (337247
     01512     041012            DAC TEMP            /CHAR. STORAGE
     01513     777775            LAW -3              /INITIALIZE LINE COUNT
     01514     041017            DAC CNTLNE
     01515     777734   PRNT33   LAW -44             /INITIALIZE CHAR.COUNT
     01516     041016            DAC LINE
     01517     750004            LAS
     01520     741100            SPA                 /CHECK FOR HALT
     01521     102074            JMS HLTST           /HALT
     01522     101570            JMS PRNTWC          /PRINT 2 CHARS
     01523     201012            LAC TEMP
     01524     244476            XOR (160160
     01525     041012            DAC TEMP
     01526     441016            ISZ LINE            /CHECK FOR 72 CHARS
     01527     601522            JMP .-5
     01530     041012            DAC TEMP            /SAVE DATA
     01531     102054            JMS CRLF            /CR,LF
     01532     441017            ISZ CNTLNE                  /CHECK FOR 3 LINES
     01533     601515            JMP PRNT33                  /NOT 3 YET
     01534     201012            LAC TEMP            /REVERSE CHAR SEQUENCE
     01535     244476            XOR (160160
     01536     041012            DAC TEMP
     01537     601513            JMP PRNT33-2
                                 .EJECT
```

```
↑↑↑↑
 01540  204477  MODL35  LAC (333247
 01541  041012         DAC TEMP
 01542  777775         LAW -3              /INITIALIZE LINE COUNT
 01543  041017         DAC CNTLNE
 01544  777734  PRNT35  LAW -44             /INITIALIZE CHAR COUNT
 01545  041016         DAC LINE
 01546  750004         LAS
 01547  741100         SPA                 /CHECK FOR HALT
 01550  102074         JMS HLTST           /HALT
 01551  201012         LAC TEMP
 01552  101570         JMS PRNTWC                  /PRINT 2CHARS
 01553  201012         LAC TEMP
 01554  244500         XOR (030030
 01555  041012         DAC TEMP
 01556  441016         ISZ LINE            /CHECK FOR 72 CHARS
 01557  601552         JMP .-5             /NOT 72 YET
 01560  041012         DAC TEMP            /SAVE DATA
 01561  102054         JMS CRLF            /CR,LF
 01562  441017         ISZ CNTLNE                  /CHECK FOR 3 LINES
 01563  601544         JMP PRNT35                  /NOT 3 YET
 01564  201012         LAC TEMP
 01565  244500         XOR (030030         /REVERSE CHAR SEQUENCE
 01566  041012         DAC TEMP
 01567  601542         JMP PRNT35-2
                /
 01570  000000  PRNTWC  0
 01571  750004         LAS
 01572  504501         AND (77777
 01573  740001         CMA
 01574  041013         DAC TEMP+1          /SPEED CONTROL
 01575  441013         ISZ TEMP+1
 01576  601575         JMP .-1
 01577  201012         LAC TEMP
 01600  700406         TLS                 /FIRST CHAR
 01601  700401         TSF
 01602  601601         JMP .-1
 01603  102265         JMS ROTAT9
 01604  041014         DAC TEMP+2
 01605  750004         LAS
 01606  504501         AND (77777
 01607  740001         CMA
 01610  041013         DAC TEMP+1          /SPEED CONTROL
 01611  441013         ISZ TEMP+1
 01612  601611         JMP .-1
 01613  201014         LAC TEMP+2
 01614  700406         TLS                 /SECOND CHARACTER
 01615  700401         TSF
 01616  601615         JMP .-1
 01617  621570         JMP* PRNTWC                 /EXIT
                .EJECT
```

```
****
                                /CALCULATE TTY OUTPUT CLOCK TIME IN MSEC.
                                /
     01700                              .LOC 1700
                                /
     01700      102054          TMEAGN  JMS CRLF
     01701      141016                  DZM LINE            /CLEAR LOOP COUNTER
     01702      760215                  LAW 215             /USE CARRIAGE RETURN
     01703      700406                  TLS                 /SELECT PRINTER
     01704      700401                  TSF                 /START 8 USEC LOOP
     01705      601707                  JMP TIME
     01706      601711                  JMP .+3
     01707      441016          TIME    ISZ LINE
     01710      601704                  JMP .-4
     01711      201016                  LAC LINE            /CONTENTS OF LINE = NO. OF
                                                            /8 USEC LOOPS BEFORE FLAG SET
     01712      742010                  RTL
     01713      740010                  RAL                 /MULTIPLY RESULT BY 8
     01714      041016                  DAC LINE            /TO GET TOTAL USEC.
     01715      101720                  JMS GODEC           /CONVERT TO DECIMAL
     01716      101751                  JMS OUTMS
     01717      601701                  JMP TMEAGN          /LOOP
                                /
                                /
                                /BINARY TO DECIMAL ROUTINE
     01720      000000          GODEC   0
     01721      142014                  DZM PCW             /CLEAR PARTIAL CONVERSION WOR
     01722      442004                  ISZ TABLE           /INCR ADDRESSES
     01723      442015                  ISZ PWRTEN
     01724      201016                  LAC LINE            /BINARY
     01725      041012                  DAC TEMP            /SAVE
     01726      744000          SUBAGN  CLL
     01727      362015                  TAD* PWRTEN         /SUBTRACT ONE POWER OF TEN
     01730      740400                  SNL                 /DONE ONE POWER IF LINK = 0
     01731      601735                  JMP DONCON
     01732      041012                  DAC TEMP            /SAVE RESULTS
     01733      442014                  ISZ PCW             /INCREMENT PARTIAL CONVERSION WORD
     01734      601726                  JMP SUBAGN          /SUBTRACT AGAIN
     01735      202014          DONCON  LAC PCW
     01736      341264                  TAD N260            /MAKE ASCII
     01737      062004                  DAC* TABLE                  /STORE
     01740      201012                  LAC TEMP
     01741      041016                  DAC LINE
     01742      222015                  LAC* PWRTEN
     01743      542022                  SAD PWRTEN+5        /SEE IF CONVERSION COMPLETED
     01744      741000                  SKP                 /DONE
     01745      601721                  JMP GODEC+1         /SUBTRACT NEXT POWER OF TEN
     01746      202023                  LAC PWRTEN+6
     01747      042015                  DAC PWRTEN
     01750      621720                  JMP* GODEC                  /EXIT
                                        .EJECT
```

```
****
                                /PRINT OUTPUT TIME IN MSEC
                                /
01751   000000          OUTMS   0
01752   202012                  LAC TABLE+6
01753   042004                  DAC TABLE
01754   442004                  ISZ TABLE
01755   222004                  LAC* TABLE
01756   041012                  DAC TEMP
01757   542012                  SAD TABLE+6
01760   601773                  JMP PRTMS
01761   202004                  LAC TABLE
01762   542013                  SAD TABLE+7
01763   601767                  JMP .+4
01764   201012                  LAC TEMP
01765   101175          OUTPRT  JMS TLSSF               /PRINT
01766   601754                  JMP OUTMS+3
01767   760256                  LAW 256                 /PERIOD
01770   101175                  JMS TLSSF
01771   201012                  LAC TEMP
01772   601765                  JMP OUTPRT
01773   042004          PRTMS   DAC TABLE
01774   202024                  LAC MSEC
01775   040012                  DAC 12
01776   102274                  JMS PHDR                /PRINT MSEC
01777   102054                  JMS CRLF
02000   750004                  LAS
02001   741100                  SPA                     /CHECK FOR HALT
02002   102074                  JMS HLTST               /HALT
02003   621751                  JMP* OUTMS
                                /
02004   002004          TABLE   .
02005   000000                  0                       /100 K
02006   000000                  0                       /TEN K
02007   000000                  0                       /THOUSANDS
02010   000000                  0                       /HUNDREDS
02011   000000                  0                       /TENS
02012   002004                  TABLE
02013   002010                  TABLE+4
02014   000000          PCW     0
                                /
02015   002015          PWRTEN  .
02016   474540                  474540                  /-100000 DECIMAL
02017   754360                  754360                  /-10000  DECIMAL
02020   776030                  776030                  /-1000   DECIMAL
02021   777634                  777634                  /-100    DECIMAL
02022   777766                  777766                  /-10     DECIMAL
02023   002015                  PWRTEN
                                .EJECT
```

```
↑↑↑↑
     02024     002024          MSEC    .
     02025     315240                  315240
     02026     305323                  305323
     02027     256303                  256303
     02030     000000                  000000
                               /
     02031     760215          ALTIM   LAW 215
     02032     141016                  DZM LINE            /CLEAR LOOP COUNTER
     02033     700406                  TLS                 /START 16 US LOOP
     02034     700401                  TSF
     02035     741000                  SKP
     02036     602044                  JMP .+6
     02037     500000                  AND Ø
     02040     500000                  AND Ø
     02041     740000                  NOP
     02042     441016                  ISZ LINE            /CONTENTS OF LINE = NO. OF
     02043     602034                  JMP ALTIM+3         /16 US LOOPS BEFORE FLAG SET
     02044     201016                  LAC LINE
     02045     744000                  CLL
     02046     742010                  RTL                 /MULT RESULT BY 16
     02047     742010                  RTL
     02050     041016                  DAC LINE
     02051     101720                  JMS GODEC           /CONVERT TO DECIMAL
     02052     101751                  JMS OUTMS
     02053     602031                  JMP ALTIM           /REPEAT
                                       .EJECT
```

```
****
                                    /CARRIAGE RETURN, LINE FEED
                                    /
00054   000000      CRLF    0
00055   760215              LAW 215
00056   700406              TLS
00057   700401              TSF
00060   602057              JMP .-1
00061   542063              SAD .+2
00062   622054              JMP* CRLF
00063   760212              LAW 212
00064   602056              JMP CRLF+2
                                    /
                                    /
                                    /ROTATE 9 RIGHT
                                    /
00065   000000      ROTAT9  0
00066   742020              RTR;        RTR;        RTR
00067   742020
00070   742020
00071   742020              RTR;        RAR
00072   740020
00073   622065              JMP* ROTAT9             /EXIT
                                    /
                                    /
                                    /PROGRAM HALT FOR ALL SUB-TESTS
                                    /
00074   000000      HLTST   0
00075   740040      PRHLT1  HLT
00076   750004              LAS
00077   622074              JMP* HLTST                          /CONTINUE
                                    /
                                    /
                                    /150 MSEC STALL
                                    /
00100   000000      STL150  0
00101   777750              LAW -30
00102   042065              DAC ROTAT9
00103   774000              LAW -4000
00104   042054              DAC CRLF
00105   442054              ISZ CRLF
00106   602105              JMP .-1
00107   442065              ISZ ROTAT9
00110   602103              JMP .-5
00111   622100              JMP* STL150             /EXIT
                                    /
                                    /
                                    /CHECK FOR SCOPE MODE
                                    /
00112   000000      SCOPE   0
00113   750004              LAS
00114   740010              RAL
00115   741100              SPA                     /1 = SCOPE
00116   442112              ISZ SCOPE
00117   622112              JMP* SCOPE
```

.EJECT

```
***
                                /CHARACTER TABLE FOR TEST 6
                                /
    002120      002120          DOTS6       .
    002121      302301                      302301;   304303;   306305
    002122      304303
    002123      306305
    002124      310307                      310307;   312311;   314313
    002125      312311
    002126      314313
    002127      316315                      316315;   320317;   322321
    002130      320317
    002131      322321
    002132      324323                      324323;   326325;   330327
    002133      326325
    002134      330327
    002135      332331                      332331;   261260;   263262
    002136      261260
    002137      263262
    002140      265264                      265264;   267266;   271270
    002141      267266
    002142      271270
                                /
    002143      242241          TST7B       242241;   244243;   246245    /!"#$%&
    002144      244243
    002145      246245
    002146      250247          TST7C       250247;   252251;   254253    /'()*+,
    002147      252251
    002150      254253
    002151      256255          TST7D       256255;   300257;   273272    /-./0:;
    002152      300257
    002153      273272
    002154      275274          TST7E       275274;   277276;   334333    /<=>?@[\
    002155      277276
    002156      334333
    002157      336335          TST7F       336335;   207337;   212215    /]↑ LEFT ARROW, BELL, CR LF
    002160      207337
    002161      212215
    002162      000000                      000000
                                /
    002163      002142          PUNCT       TST7B-1
    002164      002145                      TST7C-1
    002165      002150                      TST7D-1
    002166      002153                      TST7E-1
    002167      002156                      TST7F-1
                                /
                                /
                                /HEADER 7A TEXT
                                /
    002170      002170          HDR7A       .
    002171      212215                      212215;   305324;   324323
    002172      305324
    002173      324323
    002174      267240                      267240;   240256;   301240
    002175      240256
```

```
02176   301240
02177   320314                  320314;   301310;   305302
02200   301310
02201   305302
02202   240324                  240324;   316301;   240304
02203   316301
02204   240304
02205   325316                  325316;   302315;   322305
02206   302315
02207   322305
02210   240323                  240323;   305323;   240324
02211   305323
02212   240324
02213   212215                  212215;   000000
02214   000000
                        /
                        /
                        /HEADER 7B TEST
                        /
02215   002215          HDR7B   .
02216   212215                  212215;   305324;   324323
02217   305324
02220   324323
02221   267240                  267240;   256302;   240240
02222   256302
02223   240240
02224   325320                  325320;   303316;   325324
02225   303316
02226   325324
02227   324301                  324301;   317311;   240316
02230   317311
02231   240316
02232   305323                  305323;   240324;   212215
02233   240324
02234   212215
02235   000000                  000000
                        /
02236   002236          PR7B    .
02237   302267                  302267    /7B
02240   000000                  000000
                        /
02241   002241          PR7C    .
02242   303267                  303267    /7C
02243   000000                  000000
                                .EJECT
```

```
****
 002244  002244  PR7D    .
 002245  304267            304267          /7D
 002246  000000            000000
                 /
 002247  002247  PR7E    .
 002250  305267            305267          /7E
 002251  000000            000000
                 /
 002252  002252  PR7F    .
 002253  306267            306267          /7F
 002254  000000            000000
                 /
 002255  002255  PR7G    .
 002256  307267            307267          /7G
 002257  000000            000000
                 /
 002260  002260  PR7H    .
 002261  310267            310267          /7H
 002262  000000            000000
                 /
 002263  002263  PR7I    .
 002264  311267            311267          /7I
 002265  000000            000000
                 /
 002266  002266  PR7J    .
 002267  312267            312267          /7J
 002270  000000            000000
                 /
 002271  002271  PR7K    .
 002272  313267            313267          /7K
 002273  000000            000000
                 /
                 /HEADER ROUTINE
                 /
 002274  000000  PHDR    0
 002275  220012            LAC* 12
 002276  741200            SNA
 002277  622274            JMP* PHDR
 002300  101175            JMS TLSSF       /PRINT FIRST
 002301  102265            JMS ROTATE
 002302  101175            JMS TLSSF       /PRINT SECOND
 002303  602275            JMP PHDR+1
                          .EOT
```

```
                        /
                        /PDP-9 TTY DIAGNOSTIC - PART 2
                        /TEST KEYBOARD
                        /TEST 1.  ILLEGAL INSTRUCTION
                        /
02500                           .LOC 2500
02500   102054          KTS1    JMS CRLF
02501   760261                  LAW 261
02502   101175                  JMS TLSSF               /PRINT 1
02503   777770                  LAW -10
02504   041012                  DAC TEMP
02505   703302                  CAF
02506   750000                  CLA                     /AC = 0
02507   700300                  700300                  /ILLEGAL IOT
02510   740200                  SZA                     /AC = 0
02511   602520                  JMP ACON                /ERROR PATH
02512   102100                  JMS STL150
02513   700301                  KSF                     /FLAG SHOULD BE CLEAR
02514   602523                  JMP OKS1                /SUCCESS PATH
02515   102112                  JMS SCOPE
02516   740040          KE01A   HLT                     /ERROR.  FLAG NOT CLEAR
02517   602505                  JMP KTS1+5
02520   102112          ACON    JMS SCOPE
02521   740040          KE01    HLT                     /ERROR.  AC NOT 0
02522   602505                  JMP KTS1+5
02523   441012          OKS1    ISZ TEMP
02524   602505                  JMP KTS1+5
02525   102112                  JMS SCOPE
02526   602550                  JMP KTS2                /EXIT
02527   602503                  JMP KTS1+3              /SCOPE
                        /
                        /TEST 2.  SET KEYBOARD FLAG
                        /
02550                           .LOC 2550
02550   102054          KTS2    JMS CRLF                /CR,LF
02551   760262                  LAW 262
02552   101175                  JMS TLSSF               /PRINT 2
02553   102054                  JMS CRLF
02554   204212                  LAC PRSKEY
02555   040012                  DAC 12
02556   102274                  JMS PHDR                /PRINT PRESS A KEY
02557   102054                  JMS CRLF
                        /
02560   703302          CKFLG   CAF                     /I/O POWER CLEAR
02561   777742                  LAW -36
02562   041016                  DAC LINE                /INITIALIZE 5 SEC COUNT
02563   700301                  KSF                     /WAIT FOR FLAG
02564   741000                  SKP
02565   602574                  JMP OKS2                /SUCCESS PATH
02566   102100                  JMS STL150
02567   441016                  ISZ LINE                /CHECK FOR 5 SEC
02570   602563                  JMP .-5
02571   102112                  JMS SCOPE               /NO FLAG.  CHECK FOR SCOPE MODE
                                .EJECT
```

```
↑↑↑↑
    Ø2572    74ØØ4Ø       KEØ2     HLT                  /NO FLAG.  WAITED 5 SEC
    Ø2573    6Ø256Ø                JMP CKFLG
    Ø2574    1Ø2112       OKS2     JMS SCOPE            /CHECK FOR SCOPE MODE
    Ø2575    6Ø31ØØ                JMP KTS3             /EXIT
    Ø2576    6Ø256Ø                JMP CKFLG            /SCOPE
                          /
                          /
                          /TEST 3.  CLEAR FLAG WITH KRB
                          /
    Ø31ØØ                          .LOC 31ØØ
    Ø31ØØ    1Ø2Ø54       KTS3     JMS CRLF             /CR,LF
    Ø31Ø1    76Ø263                LAW 263
    Ø31Ø2    1Ø1175                JMS TLSSF            /PRINT 3
    Ø31Ø3    1Ø2Ø54                JMS CRLF
    Ø31Ø4    2Ø4212                LAC PRSKEY
    Ø31Ø5    Ø4ØØ12                DAC 12
    Ø31Ø6    1Ø2274                JMS PHOR             /PRINT PRESS A KEY
    Ø31Ø7    1Ø2Ø54                JMS CRLF
    Ø311Ø    7Ø33Ø2       CLRFL    CAF                  /I/O POWER CLEAR
    Ø3111    7ØØ3Ø1                KSF
    Ø3112    6Ø3111                JMP .-1              /WILL LOOP UNTIL FLAG SETS
    Ø3113    7ØØ312                KRB                  /READ, CLEAR FLAG
    Ø3114    7ØØ3Ø1                KSF                  /SHOULD NOT SKIP
    Ø3115    6Ø3121                JMP OKS3             /SUCCESS PATH
    Ø3116    1Ø2112                JMS SCOPE
    Ø3117    74ØØ4Ø       KEØ3     HLT                  /ERROR.  KRB DID NOT CLEAR FLAG
    Ø312Ø    6Ø311Ø                JMP CLRFL
    Ø3121    1Ø2112       OKS3     JMS SCOPE            /CHECK FOR SCOPE MODE
    Ø3122    6Ø315Ø                JMP KTS4             /EXIT
    Ø3123    6Ø311Ø                JMP CLRFL
                                   .EJECT
```

````
††††
                                      /TEST 4.   CLEAR BUFFER TO ONES WITH CAF
                                      /
03150                                           .LOC 3150
03150       102054          KTS4        JMS CRLF           /CR,LF
03151       760264                      LAW 264
03152       101175                      JMS TLSSF          /PRINT 4
03153       102054                      JMS CRLF
03154       703302                      CAF                /I/O POWER CLEAR
03155       700312                      KRB
03156       544040                      SAD TH77           /MUST = 377
03157       741000                      SKP
03160       603174                      JMP ERR4
03161       204212                      LAC PRSKEY
03162       040012                      DAC 12
03163       102274                      JMS PHDR           /PRINT PRESS A KEY
03164       102054                      JMS CRLF
03165       700301          CLRBF       KSF
03166       603165                      JMP .-1            /WAIT FOR INPUT
03167       700312                      KRB                /READ, CLEAR FLAG
03170       703302                      CAF                /I/O POWER CLEAR
03171       700312                      KRB
03172       544040                      SAD TH77           /MUST = 377
03173       603203                      JMP OKS4           /SUCCESS PATH
03174       041012          ERR4        DAC TEMP
03175       102112                      JMS SCOPE          /CHECK FOR SCOPE MODE
03176       741000                      SKP
03177       603165                      JMP CLRBF          /SCOPE
03200       201012                      LAC TEMP
03201       740040          KE04        HLT                /AC = CONTENTS OF BUFFER
03202       603165                      JMP CLRBF
03203       102112          OKS4        JMS SCOPE          /CHECK FOR SCOPE MODE
03204       741000                      SKP
03205       603165                      JMP CLRBF
03206       750004                      LAS
03207       742010                      RTL
03210       741100                      SPA                /CHECK FOR LOOP ON TEST 2-4
03211       602550                      JMP KTS2           /LOOP
03212       102054                      JMS CRLF
03213       760317                      LAW 317
03214       101175                      JMS TLSSF
03215       760313                      LAW 313
03216       101175                      JMS TLSSF
03217       102054                      JMS CRLF
03220       740040          PRHLT2      HLT                /END OF LOGIC TESTS
                                                           /PRESS CONTINUE FOR
                                                           /INSTRUCTIONS FOR TEST5
                                                           /OR SET ADDRESS SWITCHES TO 3300
                                                           /AND PRESS START
                                                           /TO OMIT INSTRUCTIONS

                                        .EJECT
````

```
↑↑↑↑
03221   102054                  JMS CRLF            /CR,LF
03222   204222                  LAC HDR5
03223   040012                  DAC 12
03224   102274                  JMS PHDR            /PRINT HEADER AND INSTRUCTIONS
03225   102054                  JMS CRLF
03226   603300                  JMP KTS5
                        /
                        /
                        /
                        /TEST 5.  KEYBOARD CHARACTER INPUT TEST
                        /ACS 0 UP = HALT TEST
                        /
03300                           .LOC 3300
03300   102054          KTS5    JMS CRLF            /CR,LF
03301   777752                  LAW -26
03302   041016                  DAC LINE
03303   750004                  LAS
03304   741100                  SPA                 /CHECK FOR HALT
03305   102074                  JMS HLTST
03306   141012                  DZM TEMP            /INITIALIZE TIMER
03307   700301          WAIT    KSF
03310   741000                  SKP
03311   603317                  JMP CHEKIN          /GOT AN INPUT
03312   441012                  ISZ TEMP
03313   603307                  JMP WAIT
03314   102054                  JMS CRLF            /TIMED OUT - WAITED 2 SECS
03315   103341                  JMS NOTHN           /PRINT NO INPUT
03316   603300                  JMP KTS5
                        /
03317   204502          CHEKIN  LAC (-35230
03320   041013                  DAC TEMP+1
03321   700312                  KRB                 /READ BUFFER
03322   040772                  DAC NEWRD           /SAVE DATA
03323   700312          CHECLK  KRB                 /READ AGAIN
03324   540772                  SAD NEWRD           /STALL AND CHECK THAT
                                                    /TTI CLOCK STOPS
03325   603330                  JMP .+3
03326   102054                  JMS CRLF
03327   603354                  JMP RDCLK           /TTI CLOCK DIDN'T STOP
03330   441013                  ISZ TEMP+1
03331   603323                  JMP CHECLK
03332   200772                  LAC NEWRD
03333   101175                  JMS TLSSF           /PRINT CHARACTER REC'D
03334   760240                  LAW 240             /SPACE
03335   101175                  JMS TLSSF
03336   441016                  ISZ LINE            /CHECK FOR 63 CHARACTERS
03337   603303                  JMP KTS5+3          /GO TO TOP OF LOOP+3
03340   603300                  JMP KTS5            /TOP OF LOOP
                                .EJECT
```

```
↑↑↑↑
                                /PRINT NO INPUT
                                /
03341   000000          NOTHN   0
03342   204256                  LAC NOINP
03343   040012                  DAC 12
03344   750004                  LAS
03345   740100                  SMA                     /CHECK FOR HALT
03346   603351                  JMP .+3
03347   102074                  JMS HLTST               /HALT
03350   603300                  JMP KTS5
03351   102274                  JMS PHDR                /PRINT NO INPUT
03352   102054                  JMS CRLF
03353   623341                  JMP* NOTHN
                                /
                                /PRINT CONTENTS OF BUFFER CONT'D SHIFTING
                                /AFTER FIRST READ
                                /
03354   204264          BDCLK   LAC NOSTOP
03355   040012                  DAC 12
03356   102274                  JMS PHDR                /PRINT INFORMATION
03357   102054                  JMS CRLF
03360   703302                  CAF
03361   603300                  JMP KTS5
                                /
                                .EJECT
```

↑↑↑↑

```
                        /TEST 6.  KEYBOARD INTERRUPT TEST
                        /TYPE ANY LENGTH MESSAGE.  END MESSAGE
                        /WITH CTRL D.  MESSAGE WILL BE PRINTED FOR
                        /VERIFICATION
                        /ACS 0 UP = HALT TEST
                        /
03374                           .LOC 3374
03374   102054                  JMS CRLF
03375   204320                  LAC HDR6
03376   040012                  DAC 12                  /HEADER
03377   102274                  JMS PHDR
03400   102054          KTS6    JMS CRLF
03401   770000                  LAW -10000
03402   041012                  DAC TEMP
03403   204447                  LAC INBUF
03404   040011                  DAC 11
03405   160011                  DZM* 11                 /CLEAR INPUT BUFFER
03406   441012                  ISZ TEMP
03407   603405                  JMP .-2
03410   204447                  LAC INBUF
03411   040011                  DAC 11
03412   102054                  JMS CRLF
03413   204503                  LAC (ISZ 0
03414   040001                  DAC 1
03415   204504                  LAC (JMP* 0
03416   040002                  DAC 2
03417   777772                  LAW -6
03420   041016                  DAC LINE
03421   204212          PHRASE  LAC PRSKEY
03422   040011                  DAC 11
03423   703302                  CAF
03424   103434                  JMS TTYOUT
03425   750004                  LAS
03426   741100                  SPA                     /CHECK FOR HALT TEST
03427   102074                  JMS HLTST               /HALT
03430   441016                  ISZ LINE                /CHECK FOR 1 LINE
03431   603421                  JMP PHRASE
03432   102054                  JMS CRLF                /CR,LF
03433   603417                  JMP PHRASE-2
                        /
03434   000000          TTYOUT  0                       /ROUTINE FOR PRESS A KEY
03435   220011                  LAC* 11
03436   041012                  DAC TEMP
03437   741200                  SNA
03440   623434                  JMP* TTYOUT
03441   103446                  JMS TLFS
03442   201012                  LAC TEMP
03443   102065                  JMS ROTAT9
03444   103446                  JMS TLFS
03445   603435                  JMP TTYOUT+1
                                .EJECT
```

```
↑↑↑↑
     03446   000000          TLFS    0
     03447   700042                  ION
     03450   700406                  TLS                     /OUTPUT ONE CHARACTER
     03451   603451                  JMP .                   /WAIT FOR INTERRUPT
     03452   700314                  IORS                    /I/O STATUS
     03453   742010                  RTL;    RAL
     03454   740010
     03455   741100                  SPA                     /CHECK KEYBOARD BIT
     03456   603470                  JMP KBRD
     03457   740010                  RAL
     03460   740100                  SMA
     03461   603466                  JMP ILLGAL              /SPURIOUS INTERRUPT
     03462   750004                  LAS
     03463   741100                  SPA
     03464   102074                  JMS HLTST
     03465   623446                  JMP* TLFS               /KEEP OUTPUTTING
                             /
     03466   740040          ILLGAL  HLT
     03467   623446                  JMP* TLFS               /CONTINUE
                             /
     03470   102054          KBRD    JMS CRLF
     03471   204447                  LAC INBUF
     03472   040011                  DAC 11
     03473   770000                  LAW -10000
     03474   041012                  DAC TEMP
     03475   160011                  DZM* 11
     03476   441012                  ISZ TEMP
     03477   603475                  JMP .-2
     03500   204447                  LAC INBUF
     03501   040011                  DAC 11
                             /
     03502   700312          NXTIN   KRB
     03503   543535                  SAD K204
     03504   603536                  JMP NOMOR               /REC'D EOT
     03505   041013                  DAC TEMP+1
     03506   201012                  LAC TEMP
     03507   740200                  SZA
     03510   603516                  JMP WATE+3
     03511   241013                  XOR TEMP+1
     03512   041012                  DAC TEMP
                                     .EJECT
```

```
↑↑↑↑
        03513   700301  WATE    KSF                     /WAIT FOR INPUT
        03514   603513          JMP .-1
        03515   603502          JMP NXTIN
        03516   201013          LAC TEMP+1
        03517   742010          RTL;        RTL;        RTL
        03520   742010
        03521   742010
        03522   742010          RTL;        RAL
        03523   740010
        03524   241012          XOR TEMP
        03525   441012          DAC TEMP                /STORE 2 INPUTS
        03526   200011          LAC 11
        03527   544505          SAD (17777
        03530   603550          JMP RUFUL               /FULL BUFFER - STOP ONPUT
        03531   201012          LAC TEMP
        03532   060011          DAC* 11
        03533   141012          DZM TEMP
        03534   603513          JMP WATE
        03535   000204  K204    204
                        /
        03536   201012  NOMOR    LAC TEMP
        03537   741200          SNA
        03540   603544          JMP .+4
        03541   204506          LAC (215000
        03542   241012          XOR TEMP
        03543   060011          DAC* 11
        03544   204447          LAC INRUF
        03545   040011          DAC 11
        03546   103434          JMS TTYOUT              /START PRINTING INFO
        03547   603401          JMP KTS6+1                      /START OVER
                        /
        03550   102054  RUFUL    JMS CRLF
        03551   204434          LAC FULL
        03552   040012          DAC 12                  /PRINT FULL INPUT BUFFER
        03553   102274          JMS PHOR
        03554   102054          JMS CRLF
        03555   703302          CAF
        03556   603544          JMP RUFUL-4             /DUMP BUFFER
                                .EJECT
```

```
****
                                /PRINT CONTENTS OF BUFFER AFTER EACH SHIFT
                                /ACS1 UP = SIMULATE CHARACTER IN ACS 10-17
                                /
03700                                       .LOC 3700
                                /
                                /HEADER ROUTINE
03700   102054                              JMS CRLF            /CR,LF
03701   760240                              LAW 240
03702   101175                              JMS TLSSF           /SPACE
03703   760311                              LAW 311
03704   101175                              JMS TLSSF           /I FOR INITIAL CONTENTS
03705   760260                              LAW 260
03706   041013                              DAC TEMP+1
03707   777773                  PRNBR       LAW -5
03710   041012                              DAC TEMP
03711   760240                              LAW 240
03712   101175                              JMS TLSSF
03713   441012                              ISZ TEMP            /5 SPACES
03714   603712                              JMP .-2
03715   201013                              LAC TEMP+1
03716   101175                              JMS TLSSF           /PRINT NUMBER
03717   544507                              SAD (LAW 271        /HAS #9 BEEN PRINTED
03720   603723                              JMP .+3             /DONE WITH HEADER
03721   441013                              ISZ TEMP+1
03722   603707                              JMP PRNBR           /5 SPACES, ANOTHER NUMBER
03723   102054                              JMS CRLF            /CR,LF
                                /
03724   750004                  RSTRT       LAS
03725   740010                              RAL
03726   741100                              SPA                 /CHECK FOR SIMULATION
03727   604062                              JMP SIMUL           /SIMULATE CHAR IN ACS 10-17
03730   777766                              LAW -12
03731   041013                              DAC TEMP+1          /STATE COUNTER
03732   204045                              LAC CONBUF
03733   040011                              DAC 11              /SETUP INPUT POINTER
03734   777776                              LAW -2
03735   041012                              DAC TEMP            /5 SEC COUNT
03736   141014                              DZM TEMP+2
03737   703302                              CAF                 /I/O POWER CLEAR
03740   700301                              KSF
03741   741000                              SKP
                                            .EJECT
```

```
****
     03742    740040          ERR7    HLT                 /FLAG SHOULD BE CLEAR.  PRESS
                                                          /CONTINUE TO IGNORE
     03743    700312                  KRB                 /READ BUFFER
     03744    060011                  DAC* 11             /INITIAL CONTENTS
     03745    044041                  DAC LAST
     03746    700312          RDBFR   KRB                 /READ
     03747    544041                  SAD LAST            /SEE IF SHIFT OCCURRED
     03750    603761                  JMP TIMOUT          /NO
     03751    060011                  DAC* 11             /STORE DATA READ
     03752    044041                  DAC LAST            /SAVE NEW DATA
     03753    141014                  DZM TEMP+2          /RE-INITIALIZE 5 SEC COUNT
     03754    777776                  LAW -2
     03755    041012                  DAC TEMP
     03756    441013                  ISZ TEMP+1          /AS SKIP = CLOCK NOT STOPPING
     03757    603746                  JMP RDBFR
     03760    603765                  JMP TIMOUT+4
     03761    441014          TIMOUT  ISZ TEMP+2          /5 SEC. COUNT
     03762    603746                  JMP RDBFR
     03763    441012                  ISZ TEMP
     03764    603746                  JMP RDBFR
     03765    204041                  LAC LAST            /LAST DATA READ AT END OF 5 SEC
     03766    060011                  DAC* 11
     03767    201013                  LAC TEMP+1
     03770    741200                  SNA
     03771    603774                  JMP .+3
     03772    441013                  ISZ TEMP+1
     03773    603765                  JMP TIMOUT+4
     03774    102054                  JMS CRLF            /CR,LF
                                      .EJECT
```

```
                        /
                        /DUMP CONTENTS OF BUFFER
                        /
03775   204045          CONBUF  LAC CONBUF
03776   040011                  DAC 11                  /SETUP POINTER
03777   777765                  LAW -13
04000   041013                  DAC TEMP+1              /STATE COUNTER
04001   220011          CONVRT  LAC* 11
04002   041012                  DAC TEMP
04003   504042                  AND K300
04004   742020                  RTR;    RTR;    RTR
04005   742020
04006   742020
04007   341264                  TAD N260
04010   101175                  JMS TLSSF               /PRINT ONE OCTAL
04011   201012                  LAC TEMP
04012   504043                  AND K70
04013   742020                  RTR;    RAR
04014   740020
04015   341264                  TAD N260
04016   101175                  JMS TLSSF               /PRINT 2ND
04017   201012                  LAC TEMP
04020   504044                  AND K7
04021   341264                  TAD N260
04022   101175                  JMS TLSSF               /PRINT 3RD
04023   441013                  ISZ TEMP+1              /CHECK FOR 11 STATES
04024   741000                  SKP
04025   604035                  JMP DONE
04026   777775                  LAW -3
04027   041012                  DAC TEMP                /3 SPACES
04030   760240                  LAW 240
04031   101175                  JMS TLSSF
04032   441012                  ISZ TEMP
04033   604031                  JMP .-2
04034   604001                  JMP CONVRT
                        /
04035   102254          DONE    JMS CRLF                /CR,LF
04036   740040          PRHLT3  HLT                     /PRESS CONTINUE TO RE-EXECUTE
04037   603724                  JMP RSTRT
04040   000377          TH77    377
04041   000000          LAST    0
04042   000300          K300    300
04043   000070          K70     70
04044   000007          K7      7
                        .EJECT
```

```
****
      004045    004045          CONBUF    .
      004046    000000                    0;          0;          0;          0
      004047    000000
      004050    000000
      004051    000000
      004052    000000                    0;          0;          0;          0
      004053    000000
      004054    000000
      004055    000000
      004056    000000                    0;          0;          0;          0
      004057    000000
      004060    000000
      004061    000000
                                  /
                                  /
                                  /SIMULATE BUFFER SHIFT
                                  /
      004062    750004          SIMUL     LAS
      004063    504040                    AND TH77
      004064    041012                    DAC TEMP
      004065    101175                    JMS TLSSF               /PRINT CHAR
      004066    102054                    JMS CRLF                /CR,LF
      004067    201012                    LAC TEMP
      004070    744010                    RCL;        RTL;        RTL
      004071    742010
      004072    742010
      004073    742010                    RTL;        RTL
      004074    742010
      004075    244040                    XOR TH77
      004076    041012                    DAC TEMP                /SAVE CHAR
      004077    204045                    LAC CONBUF
      004100    040011                    DAC 11                  /SETUP POINTER
      004101    777766                    LAW -12
      004102    041013                    DAC TEMP+1              /STATE COUNTER
      004103    201012          STORE     LAC TEMP                /INITIAL CONTENTS
      004104    504040                    AND TH77
      004105    060011                    DAC* 11
      004106    201012                    LAC TEMP
      004107    740020                    RAR
      004110    041012                    DAC TEMP
      004111    441013                    ISZ TEMP+1
      004112    604103                    JMP STORE
      004113    740010                    RAL
      004114    060011                    DAC* 11                 /STATE 9
      004115    603775                    JMP CONVRT-4            /DUMP BUFFER CONTENTS
                                          .EJECT
```

↑↑↑↑

```
                                /SCOPE MODE LOOP FOR KEYBOARD
                                /
     04200                              .LOC 4200
                                /
     04200      703302          KBSCOP  CAF                     /I/O POWER CLEAR
     04201      700301                  KSF
     04202      604201                  JMP .-1
     04203      750004                  LAS                     /CHECK FOR HALT
     04204      741100                  SPA
     04205      741000                  SKP
     04206      604200                  JMP KBSCOP
     04207      700312                  KRB
     04210      102074                  JMS HLTST
     04211      604200                  JMP KBSCOP              /CONTINUE
                                /
                                /
                                /CONSTANTS FOR TEXTS, TABLES, HEADERS
                                /PRESS A KEY
     04212      004212          PRSKEY  .
     04213      322320                  322320;   323305;   240323
     04214      323305
     04215      240323
     04216      240301                  240301;   305313;   240331
     04217      305313
     04220      240331
     04221      000000                  000000
                                        .EJECT
```

```
****
      004222      004222          HDR5        .
      004223      305324                      305324;   324323;   265240;   240256
      004224      324323
      004225      265240
      004226      240256
      004227      303240                      303240;   301310;   301322;   324303
      004230      301310
      004231      301322
      004232      324303
      004233      322305                      322305;   311240;   320316;   324325
      004234      311240
      004235      320316
      004236      324325
      004237      324240                      324240;   323305;   256324;   212215
      004240      323305
      004241      256324
      004242      212215
      004243      303301                      303301;   240323;   240260;   320325
      004244      240323
      004245      240260
      004246      320325
      004247      275240                      275240;   310240;   314301;   240324
      004250      310240
      004251      314301
      004252      240324
      004253      305324                      305324;   324323;   000000
      004254      324323
      004255      000000
                                  /NO INPUT
                                  /
      004256      004256          NOINP       .
      004257      317316                      317316;   311240;   320316
      004260      311240
      004261      320316
      004262      324325                      324325;   000000
      004263      000000
                                              .EJECT
```

```
†††

                                    /CONTENTS OF BUFFER CONT'D SHIFTING
                                    /
 04264      004264                 NOSTOP  .
 04265      317303                         317303;   324316;   316305;   323324
 04266      324316
 04267      316305
 04270      323324
 04271      317240                         317240;   240306;   325302;   306306
 04272      240306
 04273      325302
 04274      306306
 04275      322305                         322305;   303240;   316317;   247324
 04276      303240
 04277      316317
 04300      247324
 04301      240304                         240304;   310323;   306311;   311324
 04302      310323
 04303      306311
 04304      311324
 04305      307316                         307316;   301240;   324306;   322305
 04306      301240
 04307      324306
 04310      322305
 04311      306240                         306240;   322311;   324323;   322240
 04312      322311
 04313      324323
 04314      322240
 04315      301305                         301305;   256304;   000000
 04316      256304
 04317      000000
                                    /
                                    /
                                    /TEST 6 HEADER AND INSTRUCTIONS
                                    /
 04320      004320                 HDR6    .
 04321      305324                         305324;   324323;   266240;   313240
 04322      324323
 04323      266240
 04324      313240
 04325      331305                         331305;   317302;   322301;   240304
 04326      317302
 04327      322301
 04330      240304
 04331      316311                         316311;   305324;   322322;   320325
 04332      305324
 04333      322322
 04334      320325
 04335      240324                         240324;   305324;   324323;   212215
 04336      305324
 04337      324323
 04340      212215
 04341      331324                         331324;   305320;   301240;   331316
 04342      305320
 04343      301240
```

```
04344   331316
04345   314240          314240;   316305;   324307;   240310
04346   316305
04347   324307
04350   240310
04351   305315          305315;   323323;   307301;   256305
04352   323323
04353   307301
04354   256305
04355   212215          212215;   316305;   240304;   305315
04356   316305
04357   240304
04360   305315
04361   323323          323323;   307301;   240305;   311327
04362   307301
04363   240305
04364   311327
04365   310324          310324;   303240;   322324;   240314
04366   303240
04367   322324
04370   240314
04371   256304          256304;   212215;   305315;   323323
04372   212215
04373   305315
04374   323323
04375   307301          307301;   240305;   311327;   314314
04376   240305
04377   311327
04400   314314
04401   302240          302240;   240305;   322320;   316311
04402   240305
04403   322320
04404   316311
04405   305324          305324;   240304;   317306;   240322
04406   240304
04407   317306
04410   240322
04411   305326          305326;   311322;   311306;   301303
04412   311322
04413   311306
04414   301303
04415   311324          311324;   316317;   215256;   301212
04416   316317
04417   215256
04420   301212
04421   323303          323303;   260240;   325240;   240320
04422   260240
04423   325240
04424   240320
04425   240275          240275;   310240;   314301;   240324
04426   310240
04427   314301
04430   240324
04431   305324          305324;   324323;   000000
04432   324323
```

04433 000000

/

.EJECT

```
††††
                              /FULL INPUT BUFFER
                              /
   04434      004434          FULL        .
   04435      325306                      325306;   314314;   311240;   320316
   04436      314314
   04437      311240
   04440      320316
   04441      324325                      324325;   302240;   306325;   305306
   04442      302240
   04443      306325
   04444      305306
   04445      240322                      240322;   000000
   04446      000000
                              /
   04447      007777          INBUF       7777
                              /
                              /CHECK FOR 1 US OR 1.2 US CYCLE TIME
                              /
   04450      702704          PARCK       FWP                 /FORCE WRONG PARITY
   04451      204400          CRPE        LAC 4000
   04452      204451                      LAC .-1
   04453      702701                      SPE                 /SKIP IF PARITY
   04454      604464                      JMP PRHLT4
   04455      702702                      CPE                 /CLEAR PARITY ERROR
   04456      204465                      LAC LK4K            /RESTORE CRPE
   04457      044451                      DAC CRPE
                              /
                                          .EJECT
```

```
↑↑↑↑
                                /ADJUST OUTPUT CLOCK TIME CONSTANTS
                                /
     04460      204510                  LAC (JMP ALTIM
     04461      041701                  DAC TMEAGN
                                /
                                /ADJUST 150 MS STALL
                                /
     04462      777754                  LAW -24
     04463      042101                  DAC STL150+1
     04464      740040          PRHLT4  HLT
                                /
                702704          FWP=702704
                702701          SPE=702701
                702702          CPE=702702
                                /
     04465      204000          LK4K    LAC 4000
                                /
                004450                  .END PARCK
     04467      020000     *LIT
     04470      000400     *LIT
     04471      212215     *LIT
     04472      242241     *LIT
     04473      000272     *LIT
     04474      317240     *LIT
     04475      337247     *LIT
     04476      160160     *LIT
     04477      333247     *LIT
     04500      030030     *LIT
     04501      077777     *LIT
     04502      742550     *LIT
     04503      440000     *LIT
     04504      620000     *LIT
     04505      017777     *LIT
     04506      215000     *LIT
     04507      760271     *LIT
     04510      602031     *LIT
```

```
ACTN        02520
ALTIM       02031
ANOTHR      01136
ANTHRO      01140
BDCLK       03354
BUFUL       03550
CHFCLK      03323
CHFKIN      03317
CKFLG       02560
CKHLT       01422
CKLINE      00737
CLRRF       03165
CLRFL       03110
CNTLNE      01017
CONBUF      04045
CONVRT      04001
CPF        702702
CRLF        02054
CRPE        04451
DONCON      01735
DONE        04035
DOTS6       02120
ERR3        00314
ERR4        03174
ERR7        03742
E01         00121
E02         00204
E03         00315
E04         00410
E04A        00425
E05         00521
E05A        00535
E05B        00537
E05C        00551
FFFD        01247
FLGERR      00120
FULL        04434
FWP        702704
GETNXT      00714
GODEC       01720
GRPUP       01015
HDR5        04222
HDR6        04320
HDR7A       02170
HDR7B       02215
HLTST       02074
ILLGAL      03466
ILLINT      00525
INBUF       04447
INCR        01235
JMP5        00523
JMP6        00524
JMS5        00770
KBRD        03470
KBSCOP      04200
```

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PR.RR          03707
PR.TWC         01570
PR.T33         01515
PRNT35         01544
PRSKEY         04212
PRSPEC         00624
PRTMS          01773
PR7B           02236
PR7C           02241
PR7D           02244
PR7E           02247
PR7F           02252
PR7G           02255
PR7H           02260
PR7I           02263
PR7J           02266
PR7K           02271
PU.CT          02163
PW.TEN         02015
RD.FR          03746
RESTRT         01321
RJMP1          01035
RJMP2          01053
RJMP3          01071
RJMP4          01107
RJMP5          01125
ROTAT9         02065
RSTRT          03724
SCHPF          02112
SIMUL          04062
SP.CF          01347
SPACNT         01327
SPAC69         01371
SP.OH          01300
SPF            702701
STI15M         02100
ST.RF          04103
SU.AGN         01726
TA.LF          02004
TEMP           01012
TH77           04040
TIME           01707
TIMOUT         03761
TLFS           03446
TL.SF          01175
TMEAGN         01701
TPINT          00514
TSTFIG         00541
TST6           00600
TST7B          02143
TST7C          02146
TST7D          02151
TST7E          02154
TST7F          02157
TS7B           01020
```

```
TS7C        01036
TS7D        01054
TS7E        01072
TS7F        01110
TS7G        01126
TS7H        01202
TS7I        01265
TS7J        01362
TS7K        01500
TTST1       00100
TTST2       00200
TTST3       00300
TTST4       00400
TTST5       00500
TTST7       00700
TTYOUT      03434
WAIT        03307
WAIE        03513
.SPACE      04466
```

```
LOCA3       00002
TTST1       00100
FLGERR      00120
E01         00121
TTST2       00200
E02         00204
OK2         00206
TTST3       00300
ERR3        00314
E03         00315
TTST4       00400
E04         00410
OK4         00412
E04A        00425
OK4A        00427
TTST5       00500
TPINT       00514
E05         00521
JMP5        00523
JMP6        00524
ILLINT      00525
E05A        00535
E05B        00537
TSTFLG      00541
E05C        00551
OK5         00553
TST6        00600
LOOPX       00623
PRSPEC      00624
TTST7       00700
GETNXT      00714
PRINT2      00724
CKLINE      00737
NOT3L       00755
LOOP7       00761
NOT3G       00764
JMSS        00770
NEWRD       00772
TEMP        01012
GROUP       01015
LINE        01016
CNTLNE      01017
TS7B        01020
RJMP1       01035
TS7C        01036
RJMP2       01053
TS7D        01054
RJMP3       01071
TS7E        01072
RJMP4       01107
TS7F        01110
RJMP5       01125
TS7G        01126
ANOTHR      01136
ANTHRO      01140
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TLSSF 01175
TS7H 01202
LNFEFD 01217
INCR 01235
FEED 01247
LOOPLF 01257
N260 01264
TS7I 01265
SPAOH 01300
RESTRT 01321
SPACNT 01327
SPACF 01347
LOOPSP 01352
ONE10 01361
TS7J 01362
SPAC69 01371
CKHLT 01422
TS7K 01500
PRNT33 01515
MODL35 01540
PRNT35 01544
PRNTWC 01570
TMEAGN 01701
TIME 01707
GODEC 01720
SUBAGN 01726
DONCON 01735
OUTMS 01751
OUTPRT 01765
PRTMS 01773
TABLF 02004
PCW 02014
PWRTFN 02015
MSEC 02024
ALTIM 02031
CRLF 02054
ROTAT9 02065
ALTST 02074
PR-LT1 02075
STL150 02100
SCOPF 02112
DOTS6 02120
TST7B 02143
TST7C 02146
TST7D 02151
TST7E 02154
TST7F 02157
PUNCT 02163
HDR7A 02170
HDR7B 02215
PR7B 02236
PR7C 02241
PR7D 02244
PR7E 02247
PR7F 02252

```
PR7G        02255
PR7H        02260
PR7I        02263
PR7J        02266
PR7K        02271
PHOR        02274
XTS1        02500
XE/1A       02516
ACAN        02520
XE/1        02521
JKS1        02523
XTS2        02550
CKFLG       02560
XE/2        02572
JKS2        02574
XTS3        03100
CLRFI       03110
XE/3        03117
JKS3        03121
XTS4        03150
CLRBF       03165
ERR4        03174
XE/4        03201
JKS4        03203
PRELT2      03220
XTS5        03300
WAIT        03307
CHSKIN      03317
CHECLK      03323
DOTHN       03341
ADCLK       03354
XTS6        03400
PHRASE      03421
TTYOUT      03434
TLFS        03446
ILLGAL      03466
XHLD        03470
NXTIN       03502
WAIE        03513
X2/4        03535
NO/OR       03536
AUFUI       03550
PRTBR       03707
XSTRT       03724
ERR7        03742
XDAFR       03746
TIMOUT      03761
CONVRT      04001
DONE        04035
PRELT3      04036
TH77        04040
LAST        04041
X3/0        04042
X7/         04043
X7          04044
```

```
CONBUF      04045
SIMUI       04062
STORE       04103
KBSCOP      04200
PRSKEY      04212
ADR5        04222
NOINP       04256
NOSTOP      04264
ADR6        04320
FULL        04434
INBUF       04447
PARCK       04450
CRPE        04451
PRHLT4      04464
LK4K        04465
.SPACE      04466
SPE        702701
CPE        702702
FWP        702704
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TST7C	Ø2146
TST7D	Ø2151
TST7E	Ø2154
TST7F	Ø2157
TS7B	Ø1Ø2Ø
TS7C	Ø1Ø36
TS7D	Ø1Ø54
TS7E	Ø1Ø72
TS7F	Ø111Ø
TS7G	Ø1126
TS7H	Ø12Ø2
TS7I	Ø1265
TS7J	Ø1362
TS7K	Ø15ØØ
TTST1	ØØ1ØØ
TTST2	ØØ2ØØ
TTST3	ØØ3ØØ
TTST4	ØØ4ØØ
TTST5	ØØ5ØØ
TTST7	ØØ7ØØ
TTYOUT	Ø3434
WAIT	Ø33Ø7
WATE	Ø3513
LOCA3	ØØØØ2
TTST1	ØØ1ØØ
FLGERR	ØØ12Ø
EØ1	ØØ121
TTST2	ØØ2ØØ
EØ2	ØØ2Ø4
JK2	ØØ2Ø6
TTST3	ØØ3ØØ
ERR3	ØØ314
EØ3	ØØ315
TTST4	ØØ4ØØ
EØ4	ØØ41Ø
JK4	ØØ412
EØ4A	ØØ425
JK4A	ØØ427
TTST5	ØØ5ØØ
IPINT	ØØ514
EØ5	ØØ521
JMP5	ØØ523
JMP6	ØØ524
ILLINT	ØØ525
EØ5A	ØØ535
EØ5B	ØØ537
TSTFLG	ØØ541
EØ5C	ØØ551
JK5	ØØ553
TST6	ØØ6ØØ
LOOPX	ØØ623
PRSPFC	ØØ624
TTST7	ØØ7ØØ
GETNXT	ØØ714
PRINT2	ØØ724
CKLINE	ØØ737
NOT3I	ØØ755
LOOP7	ØØ761
NOT3G	ØØ764
JMSS	ØØ77Ø
TENRD	ØØ772
TEMP	Ø1Ø12
GROUP	Ø1Ø15
LINF	Ø1Ø16
CNTLNE	Ø1Ø17
TS7B	Ø1Ø2Ø
RJMP1	Ø1Ø35
TS7C	Ø1Ø36
RJMP2	Ø1Ø53
TS7D	Ø1Ø54
RJMP3	Ø1Ø71
TS7E	Ø1Ø72
RJMP4	Ø11Ø7
TS7F	Ø111Ø
J	Ø112Ø
RJMP5	Ø1125
TS7G	Ø1126
ANOTHR	Ø1136
ANTHRO	Ø114Ø
TLSSF	Ø1175
TS7H	Ø12Ø2
LNFEFD	Ø1217
INCR	Ø1235
FEFD	Ø1247
LOOPLF	Ø1257
N26Ø	Ø1264
TS7I	Ø1265
SPAOH	Ø13ØØ
RESTRT	Ø1321
SPACNT	Ø1327
SPACF	Ø1347
LOOPSP	Ø1352
JNF1Ø	Ø1361
TS7J	Ø1362
SPAC69	Ø1371
CKHLT	Ø1422
TS7K	Ø15ØØ
PRNT33	Ø1515
NOHL35	Ø154Ø
PRNT35	Ø1544
PRNTWC	Ø157Ø
IMFAGN	Ø17Ø1
TIME	Ø17Ø7
GOUEC	Ø172Ø
SUBAGN	Ø1726
JOBCON	Ø1735
OUTMS	Ø1751
OUTPRT	Ø1765
PRTMS	Ø1773
TABLF	Ø2ØØ4
PCH	Ø2Ø14
PWRTEN	Ø2Ø15
HSEC	Ø2Ø24
ALTIM	Ø2Ø31
CRLF	Ø2Ø54
ROTATR	Ø2Ø65
HLTST	Ø2Ø74
PRHLT1	Ø2Ø75
STL15Ø	Ø21[illegible]
SCOPE	Ø2112
JOTS6	Ø212[illegible]
TST7B	Ø2143
TST7C	Ø2146
TST7D	Ø2151
TST7E	Ø2154
TST7F	Ø2157
PUNCT	Ø2163
HDR7A	Ø217Ø
HDR7B	Ø2215
PR7B	Ø2236

?R?C	02241
?R?D	02244
?R?E	02247
?R?F	02252
?R?G	02255
?R?H	02260
?R?I	02263
?R?J	02266
?R?K	02271
?H?R	02274
?TS1	02[illegible]
?F?1A	02[illegible]
?C?N	02[illegible]
?F?1	02521
?KS1	02523
?TS2	02552
?KFLG	02560
?E?2	02572
?KS2	02574
?TS3	03100
?LRFI	03110
?E?3	03117
?K?3	03121
?TS4	03150
?CL?RF	03165
?R?4	03174
?E?4	03241
?K?4	03243
?PR?LT2	03220
?TS5	03[illegible]
?AIT	03[illegible]
?HFKIN	03317
?HFCLK	03323
?DIHM	03341
?DCLK	03354
?TS6	03[illegible]
?HASE	03[illegible]
?TYOUT	03434
?LFS	03446
?LLGAL	03[illegible]
?R?D	03470
?XFIN	03502
?AIE	03513
?244	03535
?0?0R	03545
?UFUI	03560
?R?BR	03707
?STRT	03724
?RR7	03742
?DHFR	03[illegible]
?IMOUT	03[illegible]
?ONVRT	04000
?ONE	04035
PRHLT3	04036
?H77	04044
?AST	04041
?300	04042
?74	04043
?7	04044
?ONBUF	04045
?IMUI	04062
?TORE	04103
?RSCOP	04200
?RSKEY	04212
?DR5	04222
?OINP	04256
?OSTOP	04[illegible]
?DR6	04324
FULL	04404
INBUF	04447
PARCK	04456
?RPE	04451
PRHLT4	04464
LK4K	04465
?PE	7027[illegible]
?PE	7027[illegible]
PWR	7027[illegible]