IBM POUGHKEEPSIE

Diagnostic Engineering Publication

1410/7010

December 1, 1963

Subject: Diagnostic Program WT01B 1415 I/O Printer Test

Sequence Number 551

Replaces WT01A

When WT01 is in card form card # 001 is a System Control Card. It does not have any control information punched in it when it is released.

Refer to "1410/7010 Introduction", Volume 1.00 for instructions on how it must be punched.

This is a modified and improved version of WT01A. The modifications include:

A. Changes necessary to be compatible with the current diagnostic format.
B. Removal of the test routine called "WMS AND BLANKS IN M & L MODES."
C. Alteration and expansion of the test routine called "WM ALIGNMENT AND WM PERIOD TESTS."
D. Inclusion of a new test routine to check on band width (detenting difference) and alignment.
E. Changing the timing section to type out the time it took to type each line instead of each pair of lines. The timing routine (now) covers 7010 as well as 1410 systems.
F. Changing the method in which the optional "SELECTED CHARACTER ROUTINE" (build your own test pattern routine) operates.

Enclosures: 26 Pages

Card Deck for CARD ONLY SYSTEMS (as punched by UP51)

8	Cards - Card Loader (1-7) and 1Core Clear
62	Cards No. 001-062 Data Cards
1	Card Execute Card

Distribution:

X 1410
X 7010
Other

WT01

1415 CONSOLE I/O PRINTER TEST

(1410/7010)

December 1, 1963

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5.00.00.0 TEST DESCRIPTION

00.1 MODIFICATIONS

This is a modified and improved version of WT01A. The modifications include:

A. Changes necessary to be compatible with the current diagnostic format. (Standard TADs at location 01000 and a Standard System Control Card to provide necessary system information and eliminate unnecessary operator intervention.)

B. Removal of the test routine called "WMS AND BLANKS IN M & L MODES." This test routine contributed little to the overall effectiveness of the test.

C. Alteration and expansion of the test routine called "WM ALIGNMENT AND WM PERIOD TESTS." See description, Section 5.00.00.2, for further information.

D. Inclusion of a new test routine to check on band width (detenting difference) and alignment.

E. Changing the timing section to type out the time it took to type each line instead of each pair of lines. The timing routine (now) covers 7010 as well as 1410 systems.

F. Changing the method in which the optional "SELECTED CHARACTER ROUTINE" (build your own test pattern routine) operates. See OPERATING PROCEDURES, Section 5.00.02.2.

00.2 DESCRIPTION

WT01 is a functional test of the Program Printout Operations of the 1415 Console I/O Printer on the 1410 or 7010 Data Processing System. Test routines are directed toward checking Character Printout, Space, Word-Mark Control, and Carriage Return and Indexing Operations. The Input Operation is tested through the use of the Console Inquiry function.

5.00.00.0 TEST DESCRIPTION (continued)

Test patterns are designed to test specific operations or phases of operations. Before each pattern is typed, the title of the test pattern selection character is typed (see Section 5.00.02.2 for use of test pattern selection character).

The test patterns, their titles and test objectives are explained in the order in which they are run. Each test line of characters is typed twice for (visual) comparison.

COLLATING SEQUENCE A

Type all characters in the COLLATING SEQUENCE for convenient visual checking.

ROCK B

Test the tilt mechanism by typing the characters located one after the other in vertical columns on the print head.

ROLL C

Test the rotate mechanism by selecting characters one after the other in horizontal bands around the print head.

TWIST D

Test the combined rotate and tilt mechanism by causing a maximum rotation and tilt between characters.

WM ALLIGNMENT AND WM PERIOD TESTS E

Exercise thoroughly spacing and backspacing mechanisms by typing word marks over every other character and then over every character. The word-mark period latch is given specific attention here.

BANDWIDTH & ALIGNMENT TEST F

The characters typed are chosen specifically to test band width (detenting difference), alignment and the action of the wear compensator. The characters, $!QNLJ, are chosen because of their rotate selections. If a band width exists, it will be greatest among these characters. They are also used in a final check during alignment (fine tuning). The "J" is used extensively to cause the wear compensator to take up slack in the rotate and select system.

5.00.00.0 TEST DESCRIPTION (continued)

All test pattern selection characters should line up in position 42 on the margin scale as a test of the spacing operation.[1]

Carriage return is always tested in two ways, by margin lever stop and again by a group mark word mark at the end of the write field. All fixed test patterns are 83 characters long. Because of the printout identification character (R normally) and the space that follows it, the first test pattern character is typed in position three and the last in position eighty-five if the tabs are set correctly. A carriage return and indexing operation is therefore initiated by both the B channel group mark word mark and an end of line condition. This produces a double space between each pair of lines of every test pattern. Look for this to occur.

00.3 EQUIPMENT

Any model 1410 or 7010 Data Processing System. The 1415 Console I/O Printer is the only I/O device tested. It is assumed to be on E channel only.

The Processing Overlap Feature is not necessary but is done in overlap mode if it is available.

00.4 CARD DECK

A complete card deck of WT01 consists of the following:

7 cards	Loader
1 card	Execute (Core Clear)
program cards[2]	Program WT01
1 card	Execute (branch to 02000)

Note: Card No. 001 is a System Control Card. It does not have any control information punched in it when it is released. See "1410/7010 Introduction," Volume 1.00, for instructions on how to punch it.

00.5 EC LEVEL OF MACHINE

Not applicable.

1. Be sure to follow instructions on setting up margin lever stops as explained in OPERATING PROCEDURES, Section 5.00.02.1.
2. See Release sheet for exact number of cards.

5.00.01.0 LOADING PROCEDURES

Use Standard Diagnostic Loading Procedure. Refer to "1410/7010 Introduction," Volume 1.00, for further information.

5.00.02.0 OPERATING PROCEDURES

02.1 Always set the right and left hand margin lever stops to their maximum right and left hand positions (0 and 85, respectively). The test patterns and the character position count both depend on this. A group of four-digit numbers separated by slashes occurs in one line of this test for counting purposes. The units position of each number corresponds to the position of the character with respect to the left-hand margin. The printout identification character R is counted as number one.

WT01 begins immediately on completion of loading and no manual intervention is required.

02.2 Test operation can be altered at any time by using the "Program Alter Routine." An Inquiry Request is acknowledged upon completion of any line of type. TADs are loaded as blanks and the locations are only tested for 1. TAD5, a Special TAD, is an exception and its use is described fully.

Standard TADs

TADs	Address	Not 1	1
TAD0	01000	Do Not	Bypass Typeouts
TAD1	01001	Do Not	Loop on Routine
TAD2	01002	Do Not	Halt on Error
TAD3	01003	Do Not	Repeat Test

Special TADs

TAD4	01004	Do Not	Typeout time to type 1 line
TAD5	01005	Do Not	Select Test Pattern by letter

TAD 0 is used only to bypass an error message typeout.

Setting TAD 4 to a 1 causes a typeout of the time it took to type the line preceding it to be given. Use only on systems with the Processing Overlap Feature.

5.00.02.0 OPERATING PROCEDURES (continued)

Use TAD 5 to select a particular test pattern by name (actually by letter). If it remains a blank, all test routines are run in order. Entering the test pattern selection character (A, B, C, ...F) causes the test to go directly to the pattern selected. The test patterns and the letters that relate to them are covered in the description, Section 5.00.00.1. Entering an X causes the test to go to the "SELECTED CHARACTER ROUTINE." After entering an M or an L in response to "ENTER MODE- M OR L," the request "ENTER DATA FIELD" is made. At this time a full line of characters with or without word marks may be entered. If the number of characters entered is less than a full line (83), the portion entered is expanded to produce a full line typeout. To have less than a full line typed out, enter a group mark word mark after the last character to be typed. The line of characters is typed twice unless TAD1 is set to loop on routine. Entering a Z in TAD 5 takes the program to the end of job message and into the next test.

5.00.03.0 OPERATING HINTS, COMMENTS

03.1 On systems equipped with overlap all test routines are typed in overlap mode. This makes it convenient to give typeouts of the length of time it takes to type a given line on request. If it is necessary to operate in unoverlap mode, reload the test, press STOP while "WT01" is being typed out, alter location 01263 to a blank, RESET and START. The test is started over from the beginning including the necessary initialization.

Should it ever be necessary to time (approximately) a carriage return operation instead of a normal line print operation, the following is offered.[1] Use the SELECTED CHARACTER ROUTINE to type a simple line, preferably blanks (b's) in Load Mode or zeros (0's). Set TAD 1 to loop on routine (location 01001 to a 1) and TAD4 to a 1 for timing. With the right hand margin selector on 85 (end of line), take several lines of outputs. Now set the margin selector to 84. This causes a carriage return and the last character of the line to be typed in column 1. The time difference between the two lines is carriage return time (approximately).

1. Timing can only be used on systems with the Processing Overlap Feature.

5.00.03.0 OPERATING HINTS, COMMENTS

03.2 The time for one pass of WT01 including all test routines, titles, etc., but no timing typeouts or Inquiry Requests is approximately 4 minutes.

03.3 The SELECTED CHARACTER ROUTINE can be used to investigate the Output Error Routine by entering a group mark word mark for the data field. This causes an underscored zero (0) followed by underscored blanks (b) to be typed. All characters are typed in column 1. Once this operation is initiated, it is not under program control and STOP or RESET must be used to terminate it.

5.00.04.0 PROGRAM STOPS, RESTARTS

There are no Normal Stops in WT01 and only one Error Stop. It is under TAD control and occurs only if TAD 2 is set to 1. The STOP follows an error typeout indicating a data check error. Push START to continue the test.

RESET and START causes the test to begin again at 02000, repeating the typeout of the test identification and performing all the initialization.

5.00.05.0 TYPEOUTS

05.1 The only typeout that has not been explained in preceding sections or may need clarification is:

*** DATA CHECK IN LAST LINE TYPED ***

This message indicates that a parity check error (Data Check) occurred during the typing of the test line above it. The character or characters involved should be underscored.

5.00.02.0 OPERATING PROCEDURES (continued)

Use TAD 5 to select a particular test pattern by name (actually by letter). If it remains a blank, all test routines are run in order. Entering the test pattern selection character (A, B, C, ...F) causes the test to go directly to the pattern selected. The test patterns and the letters that relate to them are covered in the description, Section 5.00.00.1. Entering an X causes the test to go to the "SELECTED CHARACTER ROUTINE." After entering an M or an L in response to "ENTER MODE- M OR L," the request "ENTER DATA FIELD" is made. At this time a full line of characters with or without word marks may be entered. If the number of characters entered is less than a full line (83), the portion entered is expanded to produce a full line typeout. To have less than a full line typed out, enter a group mark word mark after the last character to be typed. The line of characters is typed twice unless TAD1 is set to loop on routine. Entering a Z in TAD5 takes the program to the end of job message and into the next test.

5.00.03.0 OPERATING HINTS, COMMENTS

03.1 On systems equipped with overlap all test routines are typed in overlap mode. This makes it convenient to give typeouts of the length of time it takes to type a given line on request. If for some reason it is necessary to operate in unoverlap mode once the test is in progress, alter location 01263 to a blank (location denotes overlap in System Control Card), RESET and START. The test is started over from the beginning including the necessary initialization.

Should it ever be necessary to time (approximately) a carriage return operation instead of a normal line print operation, the following is offered.[1] Use the SELECTED CHARACTER ROUTINE to type a simple line, preferably blanks (b's) in Load Mode or zeros (0's). Set TAD 1 to loop on routine (location 01001 to a 1) and TAD4 to a 1 for timing. With the right hand margin selector on 85 (end of line), take several lines of outputs. Now set the margin selector to 84. This causes a carriage return and the last character of the line to be typed in column 1. The time difference between the two lines is carriage return time (approximately).

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APPENDIX

1415 CONSOLE PRINTER

TRANSLATOR, OUTPUT

BCD Bits	Magnet Picked
$\overline{2}$	R1
$\overline{8} \cdot 4$	R2
$\overline{8} + 4$	R2A
$8 \cdot \overline{1} + \overline{8} \cdot 1$	R5
$\overline{A}$	T1
$\overline{B}$	T2
$\overline{C}$	CK
$\overline{8 \cdot 4 \cdot 2 \cdot 1 + 8 \cdot 4}$	UC
All others	LC
^{v} (Word Mark)	UC· CK
_ (Underscore)	UC· CK· T1· T2

TRANSLATOR, INPUT

Contacts Transferred	BCD Bit
$R5 \cdot \overline{R2A} \cdot LC + \overline{R5} \cdot R2A + \overline{R5} \cdot UC$	1
$R1 \cdot \overline{R2A} \cdot + LC \cdot R1$	2
$R2 \cdot \overline{R2A}$	4
$R2A \cdot LC + \overline{R2A} \cdot UC$	8
T1	A
T2	B
CK + Space	C
Word Mark	WM

Contracts transfer when corresponding magnet is NOT picked, except R5 which transfers when magnet is picked.
Keyboard to contact coding is same as magnets picked.

1415 CONSOLE PRINTER

Character	BCD Code	Magnets Picked
b (Blank)	C	R1 R2 R2A T1 T2 UC *
. (Period	B A 8 2 1	C LC
¤)	C B A 8 4	R1 R2A R5 UC
[	B A 8 4 1	R1 R2A C UC
<	B A 8 4 2	R2A R5 C UC
‡ (Group Mark)	C B A 8 4 2 1	R2A UC
& (Ampersand) +	C B A	R1 R2 R2A UC *
$	C B 8 2 1	T1 LC
*	B 8 4	R1 R2A R5 T1 C UC
]	C B 8 4 1	R1 R2A T1 UC
;	C B 8 4 2	R2A R5 T1 UC
Δ	B 8 4 2 1	R2A T1 C UC
-	B	R1 R2 R2A T1 C UC *
/	C A 1	R1 R2 R2A R5 T2 LC *
, (Comma)	C A 8 2 1	T2 LC
% ( ) (	A 8 4	R1 R2A R5 T2 C UC
~ (Wd Separator)	C A 8 4 1	R1 R2A T2 UC
\	C A 8 4 2	R2A R5 T2 UC
⧺ Segment Mark	A 8 4 2 1	R2A T2 C UC
⧵ Substitute	A	R1 R2 R2A T2 C UC *
⧻ Blank =	8 2 1	T1 T2 C LC
@ ,	C 8 4	R1 R2A R5 T1 T2 UC
:	8 4 1	R1 R2A T1 T2 C UC
>	8 4 2	R2A R5 T1 T2 C UC
⌐ (Tape Mark)	C 8 4 2 1	R2A T1 T2 UC
?	C B A 8 2	R5 LC
A	B A 1	R1 R2 R2A R5 C LC
B	B A 2	R2 R2A C LC
C	C B A 2 1	R2 R2A R5 LC
D	B A 4	R1 R2A C LC
E	C B A 4 1	R1 R2A R5 LC
F	C B A 4 2	R2A LC
G	B A 4 2 1	R2A R5 C LC
H	B A 8	R1 R5 C LC
I	C B A 8 1	R1 LC
I	B 8 2	R5 T1 C LC
J	C B 1	R1 R2 R2A R5 T1 LC
K	C B 2	R2 R2A T1 LC
L	B 2 1	R2 R2A R5 T1 C LC
M	C B 4	R1 R2A T1 LC
N	B 4 1	R1 R2A R5 T1 C LC
O	B 4 2	R2A T1 C LC
P	C B 4 2 1	R2A R5 T1 LC

* From keyboard R5 selected instead of R1, R2, R2A.

1415 Console Printer (continued)

Character		BCD Code							Magnets Picked								
Q		C	B		8				R1			R5	T1				LC
R			B		8			1	R1				T1		C		LC
≠	(Record Mark)			A	8		2					R5		T2	C		LC
S		C		A			2	1		R2	R2A	R5		T2			LC
T				A			2	1		R2	R2A	R5		T2	C		LC
U		C		A		4			R1		R2A			T2			LC
V				A		4		1	R1		R2A	R5		T2	C		LC
W				A		4	2				R2A			T2	C		LC
X		C		A		4	2	1			R2A	R5		T2			LC
Y		C		A	8				R1			R5		T2			LC
Z				A	8			1	R1					T2	C		LC
0		C			8		2					R5	T1	T2			LC
1								1	R1	R2	R2A	R5	T1	T2	C		LC
2							2			R2	R2A		T1	T2	C		LC
3		C					2	1		R2	R2A	R5	T1	T2			LC
4						4			R1		R2A		T1	T2	C		LC
5		C				4		1	R1		R2A	R5	T1	T2			LC
6		C				4	2				R2A		T1	T2			LC
7						4	2	1			R2A	R5	T1	T2	C		LC
8					8				R1			R5	T1	T2	C		LC
9		C			8			1	R1				T1	T2			LC
v	(Word Mark)														C	UC	
_	(Underscore)												T1	T2	C	UC	

```
R WTØ1B
R
R
R COLLATING SEQUENCE                         A
R
R    .. ¤¤ [[ << ‡‡ && $$ ** ]] ;; ΔΔ -- // ,, %% ~~ \\ ** ƀƀ ## @@ :: >> √√ ?? /ØØ85
R    .. ¤¤ [[ << ‡‡ && $$ ** ]] ;; ΔΔ -- // ,, %% ~~ \\ ** ƀƀ ## @@ :: >> √√ ?? /ØØ85
R
R AA BB CC DD EE FF GG HH II !! JJ KK LL MM NN OO PP QQ RR ‡‡ SS TT UU VV WW XX YY ZZ
R AA BB CC DD EE FF GG HH II !! JJ KK LL MM NN OO PP QQ RR ‡‡ SS TT UU VV WW XX YY ZZ
R
R ØØ 11 22 33 44 55 66 77 88 99 35 /ØØ4Ø/ØØ45/ØØ5Ø/ØØ55/ØØ6Ø/ØØ65/ØØ7Ø/ØØ75/ØØ8Ø/ØØ85
R ØØ 11 22 33 44 55 66 77 88 99 35 /ØØ4Ø/ØØ45/ØØ5Ø/ØØ55/ØØ6Ø/ØØ65/ØØ7Ø/ØØ75/ØØ8Ø/ØØ85
R
R ROCK                                       B
R
R #,$.IRZ96WOFDMU42SKB?!‡Ø8YQHGPX75VNECLT31/JA√*Δ‡[]~:bƀ-&<;\>@%*¤#,$.IRZ96WOFDMU42SK
R #,$.IRZ96WOFDMU42SKB?!‡Ø8YQHGPX75VNECLT31/JA√*Δ‡[]~:bƀ-&<;\>@%*¤#,$.IRZ96WOFDMU42SK
R
R ROLL                                       C
R
R #9642Ø87531√:b>]%\ƀ~*/TVXY‡SUWZ,$ROMK!QPNLJΔ]-;*¤<&[‡ACEGH?BDFI.$,#9642Ø87531√:b>@%
R #9642Ø87531√:b>]%\ƀ~*/TVXY‡SUWZ,$ROMK!QPNLJΔ]-;*¤<&[‡ACEGH?BDFI.$,#9642Ø87531√:b>@%
R
R TWIST                                      D
R
R @E%N*V¤5<7;X\P>]b?ƀ!-‡&Ø[4]U~M:D√F*OΔW‡6‡̆.¤5<7&Ø[4‡6F√D:?bG>E@E%N*V¤5<7\XA.A.A.A.A.
R @E%N*V¤5<7;X\P>]b?ƀ!-‡&Ø[4]U~M:D√F*OΔW‡6‡̆.¤5<7&Ø[4‡6F√D:?bG>E@E%N*V¤5<7\XA.A.A.A.A.
R
R WM ALIGNMENT AND WM PERIOD TESTS           E
R
R ĬIĬIM̆MM̆MĬ!Ĭ!Y̆YY̆Y˘:˘:W̆WW̆W‡̆‡‡̆‡X̆XX̆XΔ̆ΔΔ̆ΔV̆VV̆V˘.˘.VV̆VV̆ΔΔ̆ΔΔ̆XX̆XX̆‡‡̆‡‡̆WW̆WW̆:˘:˘YY̆YY̆!Ĭ!ĬMM̆MM̆IĬIĬ
R ĬIĬIM̆MM̆MĬ!Ĭ!Y̆YY̆Y˘:˘:W̆WW̆W‡̆‡‡̆‡X̆XX̆XΔ̆ΔΔ̆ΔV̆VV̆V˘.˘.VV̆VV̆ΔΔ̆ΔΔ̆XX̆XX̆‡‡̆‡‡̆WW̆WW̆:˘:˘YY̆YY̆!Ĭ!ĬMM̆MM̆IĬIĬ
R
R V̆V̆V̆V̆Δ̆Δ̆Δ̆Δ̆˘.MMMMIIII˘.VVVVΔΔΔΔ˘.MMMMIIII˘.˘.˘.˘.˘.˘.˘.˘.˘.˘.˘.˘.˘.IIIIMMMM˘.ΔΔΔΔVVVV˘.IIIIMMMM˘.Δ̆Δ̆Δ̆Δ̆V̆V̆V̆V̆
R V̆V̆V̆V̆Δ̆Δ̆Δ̆Δ̆˘.MMMMIIII˘.VVVVΔΔΔΔ˘.MMMMIIII˘.˘.˘.˘.˘.˘.˘.˘.˘.˘.˘.˘.˘.IIIIMMMM˘.ΔΔΔΔVVVV˘.IIIIMMMM˘.Δ̆Δ̆Δ̆Δ̆V̆V̆V̆V̆
R
R BANDWIDTH & ALIGNMENT TEST                 F
R
R JJLNQ!$JJJJJJJJJJLNQ!$JJJJJJJJJJLNQ!$JJJJJJJJJJLNQ!$JJJJJJJJJJLNQ!$JJJJJJJJJJLNQ!$J
R JJLNQ!$JJJJJJJJJJLNQ!$JJJJJJJJJJLNQ!$JJJJJJJJJJLNQ!$JJJJJJJJJJLNQ!$JJJJJJJJJJLNQ!$J
R                        *** END OF JOB ***
R
```

```
PGLIN  LABEL   OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION
1002   LOADER  EQU    400
1003
1004   *               *****   STANDARD TADS     *****
1005           ORG     1000                                                01000
1006   *               NOT 1           1
1007   TAD0    DC      a a     DO NOT  BYPASS TYPE OUTS                    1  01000
1008   TAD1            a a     DO NOT  LOOP ON ROUTINE                     1  01001
1009   TAD2            a a     DO NOT  HALT ON ERRORS                      1  01002
1010   TAD3            a a     DO NOT  REPEAT PROGRAM                      1  01003
1011
1012                   *TEST SET UP IN THE NOT 1 CONDITION*
1013                    AND WILL ONLY CHECK FOR A 1
1014
1015   *               *****   SPECIAL  TADS     *****
1016
1017   TAD4    DC      a a     DO NOT  TYPEOUT TIME TO TYPE 1 LINE         1  01004
1018                                   USE ONLY IF SYSTEM HAS OVERLAP
1019   TAD5            a a     DO NOT  SELECT TEST PATTERN BY LETTER       1  01005
1020
1021                                   * THE FOLLOWING MAY BE USED IN
1022                                     TAD5 TO SELECT TEST PATTERNS
1023                                   A  TEST A  COLLATING SEQUENCE
1024                                   B  TEST B  ROCKING EXERCISE
1025                                   C  TEST C  ROLLING EXERCISE
1026                                   D  TEST D  TWISTING EXERCISE
1027                                   E  TEST E  WORDMARK ALIGNMENT
1028                                   F  TEST F  BANDWIDTH-ALIGNMENT
1029                                   X  TEST X  SELECTED CHARACTERS
1030                                   Z  THEEND  EOJ MESSAGE & B 400
1031   GMWM    DCW     aGMa                                                1  01006
```

```
PGLIN   LABEL    OPCOD  OPERAND                                                      CT  ADDRS  INSTRUCTION

1033    *              *PRCGRAM ALTER AND CONTROL ROUTINE
1034
1035    CONTRL   SBR    CTLXIT&5          STORE RETURN ADDR                           7  01007  G 01081 B
1036    ENTER    RCP    ADDRES&4          ENTER LOCATION TO BE ALTERED               10  01014  M %T0 01049 R
1037             BNT1   CTLXIT            INQ NOT FROM CONSOLE                        7  01024  R 01076 B
1038             BEX1   ENTER,M           TRY AGAIN IF 1/2/4/8                        7  01031  R 01014 M
1039             BA1    ADDRES                                                        7  01038  R 01045 M
1040    ADDRES   RCPW   00000             ENTER DATA INTO ADDRES SPECIFIED           10  01045  L %T0 00000 R
1041             BEX1   ADDRES,M                                                      7  01055  R 01045 M
1042             BA1    *&1                                                           7  01062  R 01069 M
1043
1044             B      TSTSEL            CHECK ON ENTRY TO SELECT A TEST             7  01069  J 01083
1045
1046    CTLXIT   B      00000             RETURN TO PROGRAM                           7  01076  J 00000
1047    *
1048    *                                 *****
1049    *
1050    TSTSEL   BCE    TESTA,TAD5,A      COLLATING SEQUENCE                         12  01083  B 02007 01005 A
1051             BCE    TESTB,TAD5,B      ROCK PATTERN                               12  01095  B 02160 01005 B
1052             BCE    TESTC,TAD5,C      ROLL PATTERN                               12  01107  B 02251 01005 C
1053             BCE    TESTD,TAD5,D      TWIST PATTERN                              12  01119  B 02342 01005 D
1054             BCE    TESTE,TAD5,E      WM ALIGNMENT & WM PERIOD TESTS             12  01131  B 02433 01005 E
1055             BCE    TESTF,TAD5,F      BANDWIDTH AND ALIGNMENT ROUTINE            12  01143  B 02555 01005 F
1056             BCE    TESTX,TAD5,X      SELECTED CHARACTER ROUTINE                 12  01155  B 02653 01005 X
1057             BCE    THEEND,TAD5,Z     EOJ MESSAGE & B 400 - NEXT TEST            12  01167  B 02993 01005 Z
1058             B      CTLXIT            RETURN TO ALTER ROUTINE                     7  01179  J 01076
1059             H                        DEFINE PRECEDING BRANCH LENGTH              1  01186  .
```

```
PGLIN   LABEL     OPCCD  OPERAND                         CT  ADDRS  INSTRUCTION

1061              ORG    1230          CONTROL INFORMATION   01230
1062              DC     @                 @             15  01244
1063              DC     @5510D@        SEQ# 551   5K   SYS1 ONLY   5  01249
1064    TESTID    DCW    @WT01@        *TEST IDENTIFICATION  4  01253
1065    LEVEL     DC     @8@,G                            1  01254
1066
1067              ORG    1256          *SYSTEM CONTROL CARD      01256
1068    SYS1      DC     @ @            INDICATE SYSTEM TYPE  1  01256
1069                                    O   1410 STD
1070                                    I   1410 ACC
1071                                    X   7010
1072                     @       @      NOT INTERROGATED      6  01262
1073                     @ @            1-SYSTEM HAS OVERLAP  1  01263
1074                     @             @ NOT INTERROGATED    15  01278
1075                     @         *@                        10  01288
1076              ORG    1289                                    01289
1077
1078    *                UTILITY TYPING AND SPACING ROUTINE
1079
1080    TYPEIT    SBR    TYPE&8         STORE ADDRESS OF MESSAGE     7  01289  G 01304 B
1081    TYPE      WCP    00000          TYPE MESSAGE                10  01296  M %T0 00000 W
1082              SBR    TYPEXT&5       STORE ADDRESS FOR RETURN     7  01306  G 01383 B
1083              BCB1   TYPE                                        7  01313  R 01296 2
1084              BA1    *&1            CONTINUE                     7  01320  R 01327 G
                                                                                       M
1085              CW     SPACEX&1                                    6  01327  ¤ 01358
1086    SPACE     SBR    SPACEX&6       EXIT WHEN SPACING            7  01333  G 01363 B
1087              WCP    ABLANK         ONE BLANK LOCATION          1C  01340  M %T0 01385 W
1088              BA1    *-16                                        7  01350  R 01340 G
                                                                                       M
1089    SPACEX    NCPWM                                              1  01357  N
1090              B      00000          EXIT WHEN SPACING            7  01358  J 00000
1091              SW     SPACEX&1                                    6  01365  , 01358
1092              BNQ    CONTRL         TO CONTROL ROUTINE           7  01371  J 01007 Q
1093    TYPEXT    B      00000          EXIT WHEN TYPING SUBTITLES, ETC  7  01378  J 00000
1094
1095    ABLANK    DCW    @ @,G          JUST FOR A SPACE             1  01385
```

```
LABEL    OPCOD OPERAND                                                  CT  ADDRS INSTRUCTION

*              INITIALIZATION- DONE ON FIRST PASS ONLY

SETUP    CS    99                    CLEAR OUT TOP 100 ADDRESSES          6  01387 / 00099
                                                                                             D
         MRCWG B2000,1               SET UP RESET RESTART BRANCH AT 1    12  01393 D 01612 00001 L
         SW    95,25                 SET WMS IN INDEX REGISTERS          11  01405 , 00095 00025
                                                                                   D
         MLWB  95,90                 MOVE THEM ALL THE WAY THROUGH       12  01416 Q 00095 00090 M
         ZA    OTIME,TIME            U SEC/PASS IN TIMING LOOP,1410      11  01428 M 01703 03587
                                                                                   B
         BCE   CK4OLP,SYS1,O         SYSTEM IS STD 1410                  12  01439 Q 01485 01256 O
         ZA    ITIME,TIME            U SEC/PASS 1410 ACC                 11  01451 M 01707 03587
                                                                                   B
         BCE   CK4OLP,SYS1,I         SYSTEM IS 1410 ACC                  12  01462 Q 01485 01256 I
         ZA    XTIME,TIME            U SEC/PASS 7010                     11  01474 M 01711 03587
CK4OLP   BCE   *&19,SYS1&7,          CHECK FOR OVERLAP                   12  01485 B 01515 01263
         SW    OVRLAP&1              SET UP FOR OVERLAP                   6  01497 , 03209
         MLCS  @@@,TYPETP&1          TYPE IN OVERLAP MODE                12  01503 D 04436 03199 3
         SW    PATRNX&84             SET ADDRESS                          6  01515 , 04436
         SAR   ENDOFX                IN INDEX REGISTER                    7  01521 G 00049 A
         SW    TWTGP&40              SETTING WORDMARK  IN PATTERN         6  01528 , 04056
         SW    SPBSP1,SPBSP1&82      SET WMS IN TEST PATTERN             11  01534 , 04100 04182
         SW    SPBSP2,SPBSP2&82                                          11  01545 , 04184 04266
         MLWB  SPBSP1&82,SPBSP1&80  MOVE WMS OVER EVERY OTHER ONE        12  01556 D 04182 04180 M
         MLWB  SPBSP2&82,SPBSP2&81                                       12  01568 D 04266 04265 M
         MLCS  @$@,ENTERX&9          SET UP READ CONSOLE PRINTER         12  01580 D 04437 02797 3
         B     TYPEIT                                                     7  01592 J 01289
         DCW   @WT01B@,G                                                  5  01603
         B     TESTA                 BEGIN TEST PATTERN SEQUENCE          7  01605 J 02007

 B2000   DCW   @J02000 @,G           RESET RESTART                        7  01612
         ORG   *&X00                                                         01700
OTIME    DCW   &0167                 U SEC/PASS IN TIMING LOOP 1410       4  01703
ITIME          &0133                 U SEC/PASS IN TIMING LOOP 1410I      4  01707
XTIME          &0047                 U SEC/PASS IN TIMING LOOP 7010       4  01711
```

```
PGLIN   LABEL    OPCOD  OPERAND                                                   CT  ADDRS  INSTRUCTION

1129             ORG    2000               PROGRAM STARTS HERE                        02000
1130    START    B      SETUP              INITIALIZATION-DONE 1ST PASS ONLY       7  02000  J 01387 .
1131
1132
1133    TESTA    B      SPACE              SPACING ROUTINE                          7  02007  J 01333
1134             B      TYPEIT             COMMON UTILITY TYPING ROUTINE            7  02014  J 01289
1135             DCW    @COLLATING SEQUENCE                         A@,G           40  02060
1136
1137    TYPEA    B      WCP                TYPE TEST PATTERN IN MOVE MODE           7  02062  J 03100
1138             DCW    CSGP1              COLLATING SEQUENCE GROUP 1               5  02073  03596
1139             B      WCP                TYPE TEST PATTERN IN MOVE MODE           7  02074  J 03100
1140             DCW    CSGP1                                                       5  02085  03596
1141
1142             B      SPACE                                                       7  02086  J 01333
1143             B      WCP                TYPE TEST PATTERN IN MOVE MODE           7  02093  J 03100
1144             DCW    CSGP2              COLLATING SEQUENCE GROUP 2               5  02104  03680
1145             B      WCP                TYPE TEST PATTERN IN MOVE MODE           7  02105  J 03100
1146             DCW    CSGP2                                                       5  02116  03680
1147
1148             B      SPACE                                                       7  02117  J 01333
1149             B      WCP                TYPE TEST PATTERN IN MOVE MODE           7  02124  J 03100
1150             DCW    CSGP3              COLLATING SEQUENCE GROUP 3               5  02135  03764
1151             B      WCP                TYPE TEST PATTERN IN MOVE MODE           7  02136  J 03100
1152             DCW    CSGP3                                                       5  02147  03764
1153
1154             BCE    TYPEA,TAD1,1       REPEAT PATTERN A                        12  02148  B 02062 01001 1
```

```
PGLIN   LABEL   OPCOD  OPERAND         COMMENTS                                   CT  ADDRS  INSTRUCTION
1156    TESTB   B      SPACE           SPACING ROUTINE                             7  02160  J 01333
1157            B      TYPEIT          COMMON UTILITY TYPING ROUTINE               7  02167  J 01289
1158            DCW    @RCCK                                       B@,G           40  02213
1159
1160    TYPEB   B      WCPW            TYPE TEST PATTERN IN LOAD MODE              7  02215  J 03115
1161            DCW    ROKGP           ROCK  GRCUP                                 5  02226  03848
1162            B      WCPW            TYPE TEST PATTERN IN LOAD MODE              7  02227  J 03115
1163            DCW    ROKGP                                                       5  02238  03848
1164
1165            BCE    TYPEB,TAD1,1    REPEAT PATTERN B                           12  02239  B 02215 01001 1
1166    *
1167    *                              *****
1168    *
1169    TESTC   B      SPACE                                                       7  02251  J 01333
1170            B      TYPEIT                                                      7  02258  J 01289
1171            DCW    @ROLL                                       C@,G           40  02304
1172
1173    TYPEC   B      WCPW            TYPE TEST PATTERN IN LOAD MODE              7  02306  J 03115
1174            DCW    ROLGP           ROLL GROUP                                  5  02317  03932
1175            B      WCPW            TYPE TEST PATTERN IN LOAD MODE              7  02318  J 03115
1176            DCW    ROLGP                                                       5  02329  03932
1177
1178            BCE    TYPEC,TAD1,1    REPEAT PATTERN C                           12  02330  B 02306 01001 1
1179    *
1180    *                              *****
1181    *
1182    TESTD   B      SPACE                                                       7  02342  J 01333
1183            B      TYPEIT                                                      7  02349  J 01289
1184            DCW    @TWIST                                      D@,G           40  02395
1185
1186    TYPED   B      WCPW            TYPE TEST PATTERN IN LOAD MODE              7  02397  J 03115
1187            DCW    TWIGP           TWIST GROUP                                 5  02408  04016
1188            B      WCPW            TYPE TEST PATTERN IN LOAD MODE              7  02409  J 03115
1189            DCW    TWIGP                                                       5  02420  04016
1190
1191            BCE    TYPED,TAD1,1    REPEAT PATTERN D                           12  02421  B 02397 01001 1
```

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PGLIN   LABEL   OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION
1193    TESTE   B      SPACE            SPACING ROUTINE                  7  02433  J 01333
1194            B      TYPEIT           COMMON UTILITY TYPING ROUTINE    7  02440  J 01289
1195            DCW    @WM ALIGNMENT AND WM PERIOD TESTS      E@,G      40  02486
1196
1197    TYPEE   B      WCPW             TYPE TEST PATTERN IN LOAD MODE   7  02488  J 03115
1198            DCW    SPBSP1           SPACE  AND BACKSPACE GROUP 1     5  02499  04100
1199            B      WCPW             TYPE TEST PATTERN IN LOAD MODE   7  02500  J 03115
1200            DCW    SPBSP1           SPACE  AND BACKSPACE GROUP 1     5  02511  04100
1201
1202            B      SPACE                                             7  02512  J 01333
1203            B      WCPW             TYPE TEST PATTERN IN LOAD MODE   7  02519  J 03115
1204            DCW    SPBSP2           SPACE  AND BACKSPACE GROUP 2     5  02530  04184
1205            B      WCPW             TYPE TEST PATTERN IN LOAD MODE   7  02531  J 03115
1206            DCW    SPBSP2           SPACE  AND BACKSPACE GROUP 2     5  02542  04184
1207
1208            BCE    TYPEE,TAD1,1     REPEAT PATTERN E                12  02543  B 02488 01001 1
1209    *
1210    *                               *****
1211    *
1212    TESTF   B      SPACE                                             7  02555  J 01333
1213            B      TYPEIT                                            7  02562  J 01289
1214            DCW    @BANDWIDTH & ALIGNMENT TEST            F@,G      40  02608
1215
1216    TYPEF   B      WCP                                               7  02610  J 03100
1217            DCW    BWAGP            BANDWIDTH AND ALIGNMENT GROUP    5  02621  04268
1218            B      WCP                                               7  02622  J 03100
1219            DCW    BWAGP            BANDWIDTH AND ALIGNMENT GROUP    5  02633  04268
1220
1221            BCE    TYPEF,TAD1,1     REPEAT PATTERN F                12  02634  B 02610 01001 1
1222
1223
1224            B      THEEND           TEST X DONE ON REQUEST ONLY      7  02646  J 02993
```

```
PGLIN  LABEL   OPCOD  OPERAND                                  CT  ADDRS  INSTRUCTION
1226   TESTX   B      SPACE                                     7  02653  J 01333
1227           B      TYPEIT                                    7  02660  J 01289
1228           DCW    @SELECTED CHARACTER ROUTINE          x@,G 40  02706
1229
1230           S      BUMP1              ZERO INDEX REGS USED TO COUNT  6  02708  S 00069
1231           B      TYPEIT                                    7  02714  J 01289
1232           DCW    @ENTER MODE- M OR L@,G                   18  02738
1233           RCPW   MODE               ENTER MODE - M OR L   10  02740  L %TO 03419 R
1234           BEX1   *-16,M             TRY AGAIN ON 1/2/4/8/A 7  02750  R 02740 M
1235           BAI    *&1                                       7  02757  R 02764 M
1236           B      TYPEIT                                    7  02764  J 01289
1237           DCW    @ENTER DATA FIELD@,G                     16  02786
1238   ENTERX  RCPW   PATRNX             ENTER CHARACTERS FOR PATTERN  1C  02788  L %TO 04352 R
1239                                    ENTER GMWM FOR SHORT LINE
1240           SBR    NEXT1              STORE ADDR OF LAST CHAR ENTERED&1  7  02798  G 00059 B
1241           BEX1   *-23,M             TRY AGAIN ON 1/2/4/8/A 7  02805  R 02788 M
1242           BAI    *&1                                       7  02812  R 02819 M
1243           C      NEXT1,&PATRNX      SEE IF ANY ENTRY WAS MADE  11  02819  C 00059 04442
1244           BE     TYPEX              NO TYPE OLD PATTERN    7  02830  J 02914 S
1245           S      &1,NEXT1           REDUCE B ADDR REG BY 1 11  02837  S 04443 00059
1246   CK4END  C      NEXT1,ENDOFX       CHECK FOR END OF PATTERN  11  02848  C 00059 00049
1247           BE     TYPEX              OK TYPE IT             7  02859  J 02914 S
1248   EXPAND  MLCWS  PATRNX&BUMP1,0&NEXT1     EXPAND TO FULL LINE  12  02866  D 04LV2 00*M0 7
1249           SBR    NEXT1              STORE ADDR OF LAST CHAR ENTERED&1  7  02878  G 00059 B
1250           A      &1,BUMP1           ADD TO COUNTERS        11  02885  A 04443 00069
1251           A      &2,NEXT1           STEP TO NEXT LOCATION  11  02896  A 04444 00059
1252           B      CK4END             SEE IF ITS ALL DONE    7  02907  J 02848
```

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PGLIN   LABEL    OPCOD  OPERAND                                                 CT  ADDRS  INSTRUCTION

1254    TYPEX    BCE    LMCDE,MODE,L     TYPE IN LOAD MODE                      12  02914  B 02957 03419 L
1255             B      WCP              TYPE TEST PATTERN IN MOVE MODE          7  02926  J 03100
1256             DCW    PATRNX           SELECTED CHARACTER AREA                 5  02937  04352
1257             B      WCP              TYPE TEST PATTERN IN MOVE MODE          7  02938  J 03100
1258             DCW    PATRNX           SELECTED CHARACTER AREA                 5  02949  04352
1259             B      *&25                                                     7  02950  J 02981
1260
1261    LMODE    B      WCPW             TYPE TEST PATTERN IN LOAD MODE          7  02957  J 03115
1262             DCW    PATRNX           SELECTED CHARACTER AREA                 5  02968  04352
1263             B      WCPW             TYPE TEST PATTERN IN LOAD MODE          7  02969  J 03115
1264             DCW    PATRNX           SELECTED CHARACTER AREA                 5  02980  04352
1265
1266             BCE    TYPEX,TAD1,1     REPEAT ROUTINE                         12  02981  B 02914 01001 1
1267    *
1268    *                                *****
1269    *
1270    THEEND   B      TYPEIT                                                   7  02993  J 01289
1271             DCW    @                            *** END OF JOB ***@,G      48  03047
1272             BNQ    CONTRL           ANY LAST REQUEST                        7. 03049  J 01007 Q
1273             BCE    TESTA,TAD3,1     REPEAT TEST-NO INITIALIZATION          12  03056  B 02007 01003 1
1274             B      LOADER           ON TO NEXT PROGRAM                      7  03068  J 00400
1275             H                       DEFINE PRECEDING BRANCH LENGTH          1  03075  .
1276    *                                *****
1277             ORG    *&X00                                                       03100
```

```
PGLIN   LABEL    OPCOD  OPERAND                                                        CT  ADDRS  INSTRUCTION

 1279   *               TEST PATTERN TYPING ROUTINE
 1280
 1281   WCP      SBR    DATA              STORE ADDRESS OF DATA PATTERN                 7  03100  G 00039 B
 1282            B      SETOP             SET UP TYPE INSTRUCTION MODE                  7  03107  J 03130
 1283            DCW    @M@               MOVE MODE                                     1  03114
 1284
 1285   WCPW     SBR    DATA              STORE ADDRESS OF TEST PATTERN                 7  03115  G 00039 B
 1286            B      SETOP             SET MODE OF TYPE INSTRUCTION                  7  03122  J 03130
 1287            DCW    @L@                                                             1  03129
 1288
 1289   SETOP    SBR    *&6               STORE M OR L OP CODE                          7  03130  G 03142 B
 1290            MLCWS  0,TYPETP          SET MODE IN TYPE INSTRUCTION                 12  03137  D 00000 03198 7
                                                                                                       Q
 1291            CW     6&DATA            SET ADDRESS                                   6  03149  ¤ 000M6
 1292            SAR    RETURN            FOR RETURN TO TEST ROUTINE                    7  03155  G 00029 A
 1293            S      TOTAL             ZERO TIMING COUNTER                           6  03162  S 03595
 1294            CS     BUFFER&82         CLEAR OUT OUTPUT AREA                         6  03168  / 03582
                                                                                                       Q
 1295            MLNA   4&DATA,*&6        SET ADDRESS OF TEST PATTERN                  12  03174  D 000M4 03191 /
                                                                                                                  D
 1296            MRCWG  0,BUFFER          SET TEST PATTERN INTO OUTPUT AREA            12  03186  D 00000 03500 L
 1297   TYPETP   WCPW   BUFFER            TYPE TEST PATTERN                            10  03198  L %T0 03500 W
 1298   OVRLAP   NOPWM                                                                  1  03208  N
 1299            BOL1   TIMER                                                           7  03209  J 03230 1
 1300            BCB1   TYPETP                                                          7  03216  R 03198 2
 1301            B      CK4ERR                                                          7  03223  J 03248
 1302   TIMER    A      TIME,TOTAL        ADD LOOP TIME TO TOTAL                       11  03230  A 03587 03595
 1303            BOL1   *-17              RETURN WHILE OVERLAP IN PROCESS               7  03241  J 03230 1
                                                                                                          G
 1304   CK4ERR   BA1    ERRORT            BRANCH TO ERROR ROUTINE                       7  03248  R 03328 M
 1305            BCE    EDITIT,TAD4,1     EDIT TIME FOR TYPEOUT                        12  03255  B 03274 01004 1
 1306            B      CK4INQ            NO TIME TYPEOUT                               7  03267  J 03314
 1307   EDITIT   MLCWA  CTLFLD,RESULT&4   PREPARE RESULT FIELD                         12  03274  D 03425 03430 X
 1308            MCE    TOTAL-4,RESULT&4  EDIT TOTAL FOR TYPING                        11  03286  E 03591 03430
 1309            WCP    RESULT            TOTAL TIME FOR ONE LINE                      10  03297  M %T0 03426 W
                                                                                                          G
 1310            BA1    *-16                                                            7  03307  R 03297 M
 1311   CK4INQ   BNQ    CONTRL            TO CONTROL ROUTINE                            7  03314  J 01007 Q
 1312            B      0&RETURN          RETURN TO TEST ROUTINE                        7  03321  J 000‡0
```

```
PGLIN   LABEL    OPCOD  OPERAND                        CT  ADDRS  INSTRUCTION
1314    *                ERROR ROUTINE
1315
1316    ERRORT   BCE    CK4HLT,TAD0,1      BYPASS ERROR TYPEOUT   12  03328  B 03392 01000 1
1317             B      TYPEIT                             7  03340  J 01289
1318             DCW    @*** DATA CHECK IN LAST LINE TYPED ***@,G 37  03383
1319             BNQ    CONTRL                             7  03385  J 01007 Q
1320    CK4HLT   BCE    HALT,TAD2,1        HALT ON ERROR      12  03392  B 03411 01002 1
1321             B      *&2                                7  03404  J 03412
1322    HALT     H                                         1  03411  .
1323             B      CK4INQ             RETURN TO TEST PATTERN TYPING  7  03412  J 03314
1324
1325    *                                 CONSTANTS, OUTPUT AREA
1326
1327    MODE     DCW    @ @,G              MODE-M OR L        1  03419
1328    CTLFLD           @  . 0@           EDIT CONTROL FIELD 5  03425
1329     RESULT          @  .  SECS@,G     TIME TO TYPE 1 LINE OF TEST GROUP  10  03426
1330
1331             ORG    *&X00              UP TO NEXT HIGHER CENTURY ADDRESS  03500
1332    BUFFER   DA     1X83,G             TYPE AREA          03500
1333    TIME     DCW    &0C00              MICROSECONDS PER PASS IN ADD LOOP  4  03587
1334    TOTAL            @000000000@      TOTAL TIME         8  03595
```

```
PGLIN   LABEL    OPCOD  OPERAND                                                        CT  ADDRS  INSTRUCTION

 1336    *              TEST PATTERNS
 1337
                                  LL LL GG                    RR .. DD                 WW
 1338   CSGP1    DC     a  .. ¤¤ BB TT MM && $$ ** BB ;; LL -- // ,, %% SSa           50  03596
                           BB SS SS         .. GG TT QQ
 1339                   a SS MM BB ## aa .. TT MM MM /0085a,G                          33  03678
 1340   CSGP2           aAA BB CC DD EE FF GG HH II :: JJ KK LL MM NN OO PPa           50  03680
 1341                   a CQ RR ** SS TT UU VV WW XX YY ZZa,G                          33  03762
 1342   CSGP3           a00 11 22 33 44 55 66 77 88 99 35 /0040/0045/0050/0a           50  03764
 1343                   a055/0060/0C65/0070/0075/0080/0085a,G                          33  03846
                                                  Q,                          TSDGLR
 1344   ROKGP           a#,$.IRZ96WOFDMU42SKBM.*08YQHGPX75VNECLT31/JAMMLMBBa           50  03848
                         W. S  L.BG
 1345                   aS. B-&T,STa%*¤#,$.IRZ96WCFDMU42SKa,G                          33  03930
                                      T. G  BSWS                    DR .  L
 1346   ROLGP           a#9642087531M. Ta%SBSM/TVXY*SUWZ,$RCMK.QPNLJLB-,*¤Ta           50  03932
                          LG      Q                   T. G
 1347                   a&BMACEGHMBDFI.$,#9642087531M. Ta%a,G                          33  04014
                                    L . B G  QS,     L R W . T S D G      L    L
 1348   TWTGP           aaE%N*V¤5T7,XSPTG MB.-*&OB4BUSM.DMFMOLWM6#.¤5T7&OB4a           50  04016
                         G  T .Q  G               L B
 1349                   aM6FMD.M GTEaE%N*V¤5T7SXA.A.A.A.A.a,G                          33  04098
                                   ,,,,     ....              DDDD               DDD
 1350   SPBSP1          aIIIIMMMM....YYYY....WWWW****XXXXLLLLVVVV...VVVVLLLa           50  04100
                         D
 1351                   aLXXXX****WWWW....YYYY....MMMMIIIIa,G                          33  04182
                             DDDD        ,,,,       DDDD        ,,,,                 ,,
 1352   SPBSP2          aVVVVLLLL.MMMM....VVVVLLLL.MMMM..................a           50  04184
                          ,,      DDDD         ,,,,        DDDD
 1353                   a..MMMM.LLLLVVVV.....MMMM.LLLLVVVVa,G                          33  04266
 1354   BWAGP           aJJLNQ.$JJJJJJJJJJLNQ.$JJJJJJJJJJLNC.$JJJJJJJJJJLNQa           50  04268
 1355                   a.$JJJJJJJJJJLNQ.$JJJJJJJJJJLNQ.$Ja,G                          33  04350
 1356   PATRNX          a                                                     a        50  04352
 1357                   a                                   a,G                        33  04434
 1358
 1359   RETURN   EQU    1,X                 ADDR OF RETURN TO TEST ROUTINE
 1360   DATA     EQU    3,X                 ADDR OF DATA FIELD TO BE TYPED
 1361   ENDOFX   EQU    5,X                 ADDR OF END OF TEST X PATTERN
 1362   NEXT1    EQU    7,X                 ADDR REG USED IN TEST X EXPANSION
 1363   BUMP1    EQU    9,X                 COUNT TO EXPAND PATTERN IN TEST X
 1364
 1365            END    START                                                                     J02000
 1365                   aaa                                                             1  04436
 1365                   a$a                                                             1  04437
 1365                   PATRNX                                                          5  04442  04352
 1365                   &1                                                              1  04443
 1365                   &2                                                              1  04444
                                      END OF ASSEMBLY
```